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ABSTRACT

This issue of Regional Development Dialogue contains selected papers presented at an expert meeting sponsored by the United Nations Centre for Regional Development on training in information systems for local and regional planning in developing countries. The following papers are included: (1) "Information System for Local and Regional Planning in Rapti IRD (Integrated Rural Development) Project, Nepal" (Heera Raj Regmi); (2) "Varying Information Needs for Local and Regional Planning and Their Implications for Training" (Hiran D. Dias); (3) "An Integrated Approach to Training for the Establishment and Use of Information Systems for Subnational Development Planning" (K. V. Sundaram); (4) "Training Needs in Information Systems for Local and Regional Development and Planning in Developing Countries" (Peter Nijkamp with Wouter de Jong); (5) "The Third Computer Revolution: Implications for Training in Developing Countries" (Marvin L. Manheim); (6) "Information Management Training for Urban and Regional Planning" (Ian Masser and T. D. Wilson); and (7) "Training in Information Systems Design for Urban and Regional Planners in Developing Countries" (John Lindsay). The text is supplemented with various tables and figures, and each paper contains bibliographic references. Comments on each paper are included, as well as a statement of the conclusions reached and recommendations made by the meeting participants and a list of the authors of the papers together with their addresses. (Author/EW)

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REGIONAL DEVELOPMENT DIALOGUE

Vol. 8, No. 1, Spring 1987

INFORMATION SYSTEM FOR LOCAL AND REGIONAL PLANNING IN RAPTI IRD PROJECT, NEPAL
HEERA RAJ REGMI

VARYING INFORMATION NEEDS FOR LOCAL AND REGIONAL PLANNING AND THEIR IMPLICATIONS FOR TRAINING
HIRAN D. DIAS

AN INTEGRATED APPROACH TO TRAINING FOR THE ESTABLISHMENT AND USE OF INFORMATION SYSTEMS FOR SUBNATIONAL DEVELOPMENT PLANNING
K. V. SUNDARAM

TRAINING NEEDS IN INFORMATION SYSTEMS FOR LOCAL AND REGIONAL DEVELOPMENT AND PLANNING IN DEVELOPING COUNTRIES
PETER NIJKAMP IN COOPERATION WITH WOUTER DE JONG

THE THIRD COMPUTER REVOLUTION: IMPLICATIONS FOR TRAINING IN DEVELOPING COUNTRIES
MARVIN L. MANHEIM

INFORMATION MANAGEMENT TRAINING FOR URBAN AND REGIONAL PLANNING
IAN MASSER AND T. D. WILSON

TRAINING IN INFORMATION SYSTEMS DESIGN FOR URBAN AND REGIONAL PLANNERS IN DEVELOPING COUNTRIES
JOHN LINDSAY

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NAGOYA, JAPAN

REGIONAL DEVELOPMENT DIALOGUE

An International Journal
Focusing on Third World Development Problems

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EDITOR'S PREFACE

The challenge of development continues to be a major issue, both intellectually and politically. Intellectually, the search for new paradigms continues, as the fashions of development approaches swing pendulum-like from political pole to political pole and from academic discipline to academic discipline. Against this background, the perennial question of the role of technology continues to be debated: Should developing countries move slowly to acquire the advanced technologies of the developed world, or should they acquire the latest of the state-of-the-art? It is interesting that in the field of information technology the question is being decided by economic forces and not by development-philosophy positions: The advent of the microcomputer has made information technology widely available at costs which, although not trivial, are within reach of many organizations and individuals in developing countries.

The microcomputer is changing the context of the role of information technology in development in very dramatic ways. Suddenly, there are major opportunities for substantial improvements in the information processing support for planning, for administration, for entrepreneurial enterprises, and for all aspects of development. How can this potential be utilized effectively, especially in urban and regional planning and development? What training is needed or desirable, for whom, in what context, for uses of microcomputers, or minis, or mainframes, or all the range of computer and information technologies?

The United Nations Centre for Regional Development (UNCRD) has been focusing attention on the role of information systems in development since 1984. The UNCRD sponsored, together with the City of Kawasaki, the First Kawasaki International Seminar on Information Systems for Urban and Regional Planning. In 1986, UNCRD organized the Expert Group Meeting on Training in Information Systems for Local and Regional Planning in Developing Countries to follow up on the conclusions of the Kawasaki Seminar and explore the training needs of developing countries in this field.

This volume presents a selection of the papers prepared for the Expert Group Meeting. (Other papers are available from the UNCRD secretariat.) The training issues tabled for discussion at the Expert Group Meeting were described by UNCRD Director, Hidehiko Sazanami, as follows:

1. What kind of training would be needed in:
    (a) Designing information systems for local and regional planning (i.e., preparing a design for the information system, specifying information requirements, data collection and validation, processing, analysis, and interpretation, and information dissemination);
    (b) Monitoring and evaluation of local and regional plans and projects;
    (c) Managing and using information systems for local and regional planning; and
    (d) Sensitizing or familiarizing planners with information concepts, information-handling skills, and information technology.
2. What should be the course content or curriculum for an appropriate training course on information systems for local and regional planning?
3. What training methods, strategies, and instructional materials would be needed to provide or deliver both formal and nonformal instruction?
4. Who should be trained?
5. When should training be provided?
6. Who will undertake the task of training the regional planners?

The papers by Heera Raj Regmi and Hiran. D. Dias set the stage for the discussion by bringing in specific examples of the development planning issues for which computer support is needed. K. V. Sundaram describes the needs for training in the context of an integrated multilevel planning approach such as in India, while Peter Nijkamp looks at the training needs from a comprehensive theoretical perspective. Marvin L. Manheim looks at the implications of the changing nature of computers and computing support for development and for training. Ian Masser and T. D. Wilson, as well as John Lindsay, survey existing training programmes and draw conclusions about desirable features of such programmes which others should consider.

The conclusions of the Expert Group Meeting are summarized in the last paper in this volume.

Following the 1986 Expert Group Meeting, UNCRD, together with the City of Kawasaki is now organizing the Second Kawasaki International Seminar on the Information Systems Challenge for Government and Business, to be held in July 1987.

In lines with UNCRD's objectives to catalyze international communications and exchange of information and experiences, we invite interested readers to communicate with UNCRD and to become part of the international network called for in the Expert Group Meeting's conclusions. Through rapid and frequent exchange of experiences, we can all advance quickly in the uses of information systems for development, and in the training of others to use such systems effectively.

Marvin L. Manheim

Regional Development Dialogue
Vol. 8, No. 1, Spring 1987

INFORMATION SYSTEM FOR LOCAL AND REGIONAL PLANNING IN RAPTI IRD PROJECT, NEPAL

Heera Raj Regmi

INTRODUCTION

Nepal is small, land-locked, and situated in South Asia. Its area is 141,181 km^2, two-thirds of which is mountainous. Physically it is divided into three main regions: (a) the Himalayan region, which includes all territory over 4,000 m above sea level; (b) the Hills area which includes territory from 600 m to 4,000 m above sea level; and (c) the Terai region which includes all land below 600 m elevation and is where most of the population are living. The relative proportions of Nepal's national land taken up by these three separate regions are 14.97, 68.03, and 17 per cent respectively. The most productive agricultural land is located in the Terai region which hence is the most densely populated. Most people speak Nepali, which is also the official government language, although the lifestyles of the people differ from region to region. With an average per capita income of around US$160 in 1984, Nepal belongs to the group of least-developed countries.

The country has a literacy rate of 28.9 per cent. The rate for females stands at less than 10 per cent. Hinduism is the principal religion, although Buddhism is also important. Most people's lifestyle revolves around the extended family household system. Nepal gained its independence in 1951 and for the first ten years an interim type of government prevailed with the King acting as head of state. In 1961 the King introduced a partyless panchayat system to the country, which has remained ever since.

Since Nepal's third amendment of the constitution, the partyless panchayat system has become more popular as a political system. The system received the people's support in a 1981 referendum, in preference to a multiparty system. The Rastriya Panchayat is the parliament of the country -- 112 members are elected by the people, and the remaining 25 per cent are nominated by the King for five-year terms. The King appoints the Prime Minister based upon the recommendation of the Rastriya Panchayat and the other ministers based on the recommendation of the Prime Minister. The Cabinet is responsible to the Rastriya Panchayat. The Rastriya Panchayat is responsible for approving the annual budget and for the formulation of laws.

The district panchayat is the second layer of this political system. There are 75 districts in the country. The district chairman is the head of the district panchayat. The district chairman, vice-chairman, one member from each of nine different *Elakas*, and all chairmen of the various district-level class organizations are also members of the district panchayat. In each district there is a district assembly composed of the district panchayat executives, Rastriya Panchayat member(s), one-third of the town panchayat executives, and the *pradhan panchas* and vice-*pradhan panchas* of all village and town panchayats. The district assembly approves district-level development plans and budgets. After the decentralization act was put into effect in 1984, the district panchayat became responsible for district-level planning, monitoring, and supervision of district-level projects.

The third level of the panchayat system is the village and town panchayats. Altogether 4,022 village panchayats and twenty-nine town panchayats are currently functioning. Each village panchayat has nine different wards. From each ward one chairman and four other members are elected to the village assembly. The *pradhan pancha* and vice-*pradhan pancha*, who are the chief and assistant chief of the village panchayat, are directly elected by the villagers. Each village assembly has a total of fifty-three members. The village panchayat executive has seventeen members, six from different class organizations, chairmen of the nine wards, and the *pradhan* and vice-*pradhan pancha*. Usually the village assembly meets twice annually and passes the annual budget and development programme. Similarly, in the case of town panchayats and town assemblies there are nine to thirty-three wards which function in the same way as village panchayats and village assemblies. According to the Nepalese constitution the highest legislative body is the Rastriya Panchayat, the highest judiciary is the Supreme Court, and the highest executive body is the Cabinet. The Prime Minister is the chief executive of the country. At the central level there are twenty-three ministries, each containing different departments. From the administrative point of view, the country is divided into five development regions, fourteen zones, and seventy-five districts. In the case of the development regions, directorates of different concerned development agencies are established, but at this level there is no administrative chief. The administrative chief of each zone is the zonal commissioner who is appointed by the King. His office is in the zonal headquarters. He is responsible for maintaining law and order within the zone as well as coordinating and supervising the district panchayat and development activities. Each district has a chief district officer, who has to maintain law and order within the district, and is responsible for the supervision and coordination of development activities.

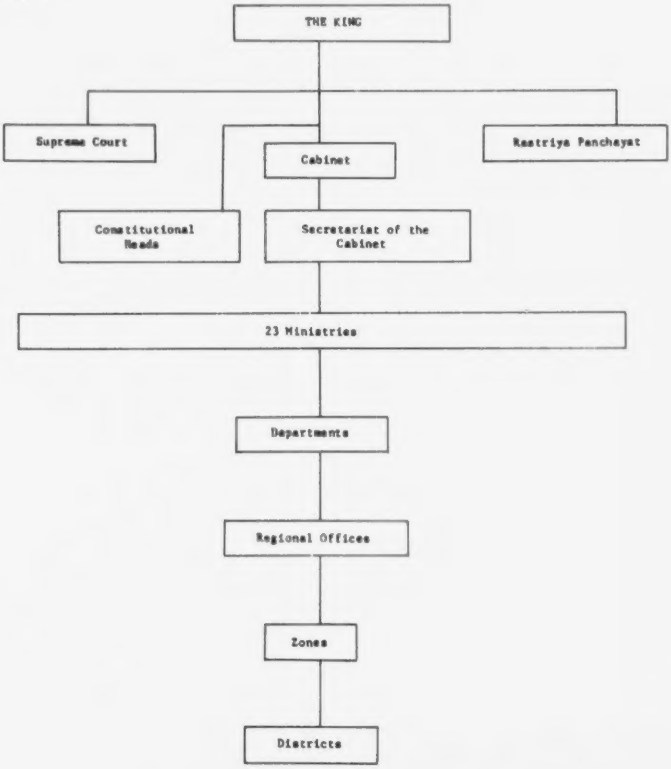
The Ministry of Panchayat and Local Development (MPLD) is the principal ministry for integrated rural development projects in Nepal. This ministry coordinates the other ministries and departments for integrated rural development (IRD) activities and helps design IRD projects. It also negotiates with donor agencies and coordinates with the Ministry of Finance and the National Planning Commission. IRDP policies which are made by the IRD Board are implemented mainly by the MPLD. The Project Coordinator's Office (PCO), which is under the MPLD, is directly responsible for the coordination, planning, monitoring (financial and physical), and reporting of the project. Most of the information of the IRDP flows to the donor and line ministries through the Project Coordinator's Office. The PCO acts as a catalyst to implement the programmes. The PCO provides logistic as well as technical support to the line agencies according to their demands. The PCO is also responsible for providing the necessary data to the government and if necessary, to the aid donor.

The Local Development Officer (LDO) is the district-level coordinator of IRD projects. He has had an administrative, supervisory, and coordinating responsibility for district-level development-oriented activities since the decentralization act was passed. The LDO is the secretary of the district panchayat as well as the representative of the Government for development in the district.

The LDO thus has an important role in the success of IRD projects in any particular district.

Those who are responsible for the running of IRD activities in the districts come from civil service cadres. Usually civil servants have very few chances to obtain training, although preservice training and in-service training are provided. During this training they obtain information on planning, budgeting, and administrative processes and policies. The administrative college is responsible for officer-level training, while for lower-level staff the Ministry of General Administration is responsible, and for accounting the Comptroller General's Office is responsible. Figure 1 shows the administrative and political organization and structure of the Government.

Figure 1. Administrative and Political Organization of the Government of Nepal


THE KING
Supreme Court
Cabinet
Rastriya Panchayat
Constitutional Heads
Secretariat of the Cabinet
23 Ministries
Departments
Regional Offices
Zones
Districts

Geographical Background of Rapti Zone

Rapti is one of the fourteen administrative zones in Nepal. It lies at the eastern edge of the midwestern development region. The total area of this zone is 10,482 km^2 while the population is estimated at around one million. Out of five districts, Dang is situated near the Indian border, and its arable land is the most productive in the zone. The other four districts, Rolpa, Pyuthan, Salyan, and Rukum, are in the mid-hills and mountain regions, where there is much less arable land. Thirty per cent of the population of the zone is concentrated on 12 per cent of the land in the Dang district. In the mid-hill districts the population growth has forced people to migrate to the terai region, whereas in the case of Dang, people are migrating to other areas of the country such as the western banks and Kailali districts.

Transportation and communication in the Dang valley is much better than in the hill districts. The country's longest highway, Mahendra Raj Marg passes through Dang district. One link road from this highway to the Zonal Headquarters, in Tulsipur, Dang, has been completed. The headquarters of the Salyan and Pyuthan districts are accessible by road only during the winter and summer (premonsoon) seasons.

CONCEPTUAL BASIS OF THE INFORMATION SYSTEM

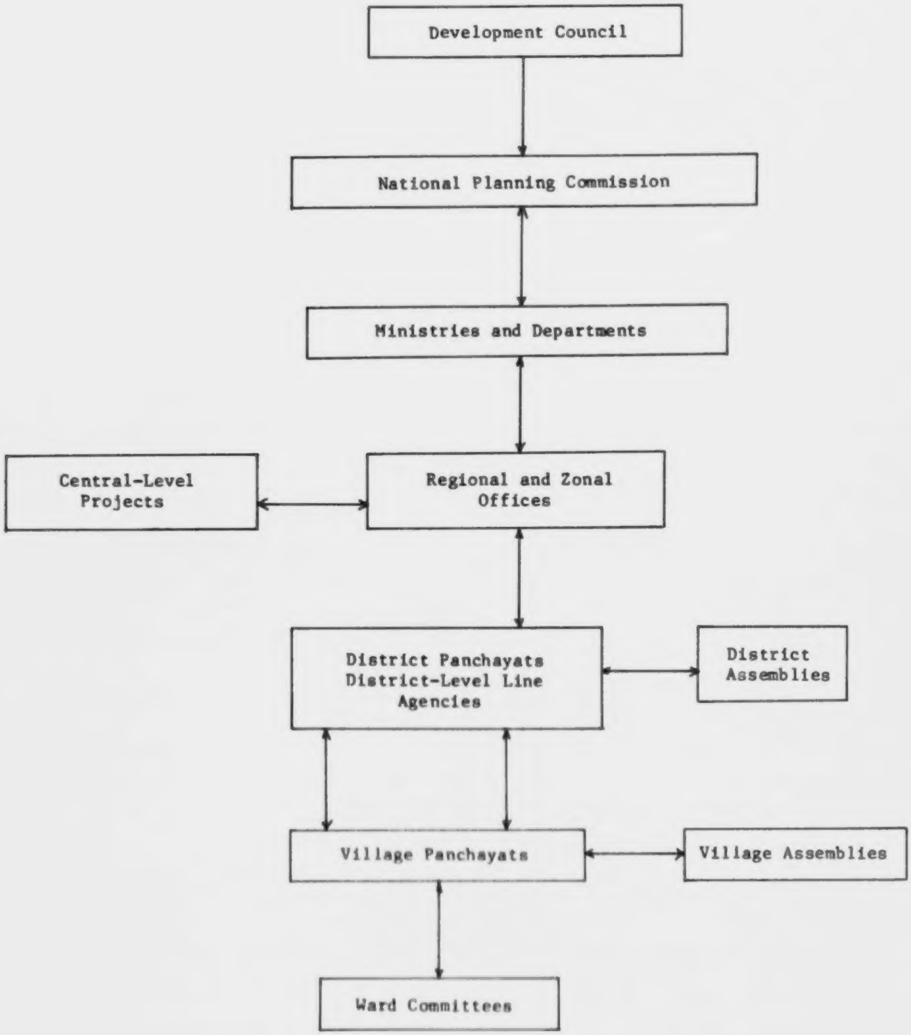
In 1957 Nepal embarked upon long-term national planning, with its first five-year plan. Before this date there had been no systematically planned development. The First Five-Year Plan's (1957-61) budget was Rs330 million. The Sixth Five-Year Plan (1980/81-1984/85) was completed in 1985.

The development council, headed by the King, contains the ministers, all members of the National Planning Commission (NPC), one-third of the seventy-five district panchayat chairmen, nominated by the Government for one year, as well as selected politicians, economists, planners, educationists, and others, nominated by the King. This council meets at least once a year. The council's objectives are to provide guidance to the National Planning Commission for long-term and annual planning and to review the planning policies of the country.

The National Planning Commission, headed by the Prime Minister includes at least five members who are nominated by the King, and are mainly responsible for planning, monitoring, and evaluation of development activities. Since the implementation of the decentralization act, the NPC is meant to review the projects of national priority each trimester. Projects are divided into national- and local-level projects. The latter are divided into district-level and village-level projects, whereas projects to be handled by ministries and departments directly are called central-level projects. The NPC is responsible for providing planning and policy guidance and the necessary budget ceilings for annual and long-term plans to the ministries and district panchayats. Ministries and departments provide information to their district-level and zonal-level line agency offices about the annual planning guidance and budget ceilings as well as technical know-how. If it is necessary, they may hold regional or zonal planning seminars. Central-level project planning is completed at these regional or zonal-level seminars or meetings with the necessary information being sent to the National Planning

Commission, concerned ministries, and district panchayats. District-level project planning should begin with regional or zonal seminars.

Figure 2. The Planning Structure of Nepal


Development Council
National Planning Commission
Ministries and Departments
Central-Level Projects
Regional and Zonal Offices
District Panchayats District-Level Line Agencies
District Assemblies
Village Panchayats
Village Assemblies
Ward Committees

After the district panchayat receives central guidance, budget ceilings, and regional-level technical information for annual or long-term planning, it calculates the required contributions from the district's own resources, such as income from land revenue and local taxes, and the cost of people's participation (volunteer labour). Then, the district panchayat secretariat provides guidance, budget ceilings, and other necessary information to the village and town panchayats with the help of different district-level line agency offices. Village and town panchayats present their plans to the village or town panchayat assembly after receiving district-level guidance and budget ceiling and calculating their local resource needs such as local taxes and the cost of people's participation. In Nepal 15 to 50 per cent of people's participation is expected for local-level projects. After the approval of the village or town panchayat assembly is obtained, the plans are sent back to the district panchayat secretariat with comments. There are five different planning committees in the district panchayat: agriculture and irrigation, construction maintenance, industry, forestry and soil conservation, health and population, and education committees. These committees discuss their corresponding line agencies' programmes which come from the village panchayats. After they approve the programmes, they forward them to the district-level joint planning committee meeting which reviews the programmes and sends them to the District Assembly. The proposed plan, when approved by the District Assembly, with or without changes, becomes the District Development Plan. It is then sent by the district panchayat to the NPC and concerned ministries. If a district assembly does not make a plan, then the district plan is drawn up by the NPC and sent to the district.

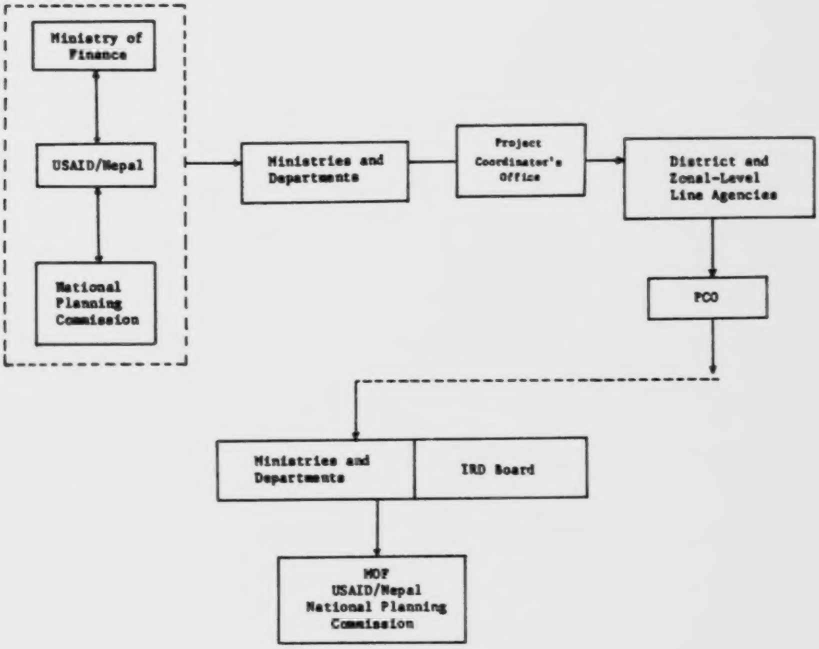
The planning process for the Rapti IRD Project is the same as the planning process for district-level plans, according to the decentralization act. However, in the case of Rapti, more information has to be sent to the district and zonal-level offices by the donor agency and Project Coordinator's Office. Figure 3 illustrates the planning system of Rapti IRD Project.

There is also a national-level IRD Board chaired by the Minister of Panchayat and Local Development and vice-chaired by the vice-chairman of the NPC. The secretaries of each concerned ministry are members of this Board. So far this Board has had little influence in the planning process, but it formulates IRD policies.

After reviewing the previous year's progress and expenditures, the donor agency (USAID/Nepal) discusses budget ceilings with the Ministry of Finance and the NPC and with the implementing agencies about new programmes. Again discussions are held with implementing agencies, ministries, and departments after which the next year's budget ceilings and new programmes (if any new programme is going to be introduced within the project area) are sent to the PCO. In the PCO local staff and expatriate advisors discuss the ceilings and programmes for the next year. The PCO then sends the detailed planning guidelines for the next year's plan to the line agencies, or holds a meeting with different line agencies at the PCO to discuss the next year's planning. District-level offices, after receiving the guidelines and budget ceilings, and with the help of the District Panchayat Secretariat, formulate district-level plans according to the decentralization act. District-level offices concerned with the

Rapti IRD Project send the plans approved by the district assembly to the NPC, their parent ministries or departments, and the Project Coordinator's Office.

Figure 3. Planning System of Rapti Integrated Rural Development Project


Ministry of Finance
USAID/Nepal
National Planning Commission
Ministries and Departments
Project Coordinator's Office
District and Zonal-Level Line Agencies
PCO
Ministries and Departments
IRD Board
MOF
USAID/Nepal
National Planning Commission

According to the National Planning Commission, the proposed programme budget package should be sent to the central government before mid-March. The Nepalese fiscal year begins 15 July, and is divided into three parts in order to monitor physical and financial activities. Every office has to send its monthly expenditure report to the central government and to the District Treasury Office by the seventh day of each month. After the completion of each trimester, every office has to send physical and financial progress reports to its central office within seven days. The same requirement exists for the annual physical and financial progress report.

DESIGN OF THE INFORMATION SYSTEM

The objectives of the information system are to keep up-to-date records on the physical progress and financial status of each project. The system also helps to monitor the impact of project activities on the zone.

Data which comes via monthly, trimesterly, and annual progress reports and the planning process is collected on a regular basis, whereas data which comes from field trip reports from the project coordinator's staff, expatriate advisors, and USAID/Nepal Rural Development Office staff is collected irregularly.

The data collected by this information system can be used for planning, monitoring, and other purposes. Prior to 1985 there was no computerization, but in 1985 some personnel were trained in the use of computers, in particular in word processing and data base management. The Project Coordinator's Office currently has one Apple IIe computer and another is expected in the near future. The USAID/ Nepal RD Office has two Wang microcomputers and an Apple IIe. In the PCO two persons operate the computer, while in the USAID/Nepal RD Office four staff members are involved in computer operations.

Annual Rapti IRD Project planning documents and progress reports are the main products of the information system. In 1982-83 the author, with the help of an advisor, designed a "Key Sort Card" information system in which all information for a particular project was entered on Key Sort Cards by the monitoring officer or his assistants. It was recommended that three kinds of cards be kept -- one for completed projects, one for current projects, and one for future projects. In this way information could be obtained in a very short time from the cards. But due to the lack of trained manpower and of proper delegation of responsibility among personnel, the system did not function well. The author, together with a planning, monitoring, and evaluation advisor, also designed a new five-page planning format to collect planning data and a one-page monitoring format for physical and financial monitoring of the projects during the advisor's contract period, 1982-83.1/ However, these formats could not be followed by line agency personnel, nor monitoring formats be updated by the line agencies or the Project Coordinator's Office.

Since 1984, when a new planning, monitoring, and evaluation advisor joined the project, the Rapti IRD Project information system has been based on the National Planning Commission's regular formats for planning and progress report collection.2/

Through these formats, important data is collected regularly. In addition, data from different field trip reports by PCO staff and USAID/ Nepal RD Office staff is collected, but not on a regular basis.3/ This computerized system was designed in late 1985 and seeks to provide rapid and up-to-date information on the project.

In designing the information system the following constraints were identified:

(1) lack of uniformity of the target or progress unit,

(2) difficulty in showing progress in terms of language description or percentage,

(3) difficulty in indicating all the problem areas of a project within a limited format,

(4) lack of qualified manpower to understand the system.

IMPLEMENTATION OF THE INFORMATION SYSTEM

The information system is used to support the various planning and monitoring cycles of the Rapti IRD Project. These cycles are as follows:

Planning Cycle

(1) Preparation of planning guidelines. This task should be performed at the central and regional levels during October and November of each year.

(2) Budget ceilings and guidelines to be distributed to the districts in December from the central level and Project Coordinator's Office.

(3) Budget and guidelines to be distributed to the village-level for planning in January.

(4) Village-level planning completed during January and mid-February.

(5) District-level plan completed between mid-February and mid-March.

(6) District-level plan sent to National Planning Commission and parent ministries in March.

(7) Approval of the IRD plan by National Planning Commission between April and May.

(8) Final approval of the budget and plan by the Ministry of Finance in June-July.

(9) Approval information sent to the district-level offices in July-August.

Monitoring Cycle

(1) Monthly financial status reports sent to PCO and Account Comptroller General's Office by the district during the first week of each month. PCO asks USAID/Nepal to reimburse expenditures every four months.

(2) Progress data sent to PCO and line ministries by the district during the first week of each new trimester for the previous four months.

(3) Annual progress data sent to PCO and line ministries during the third week of July -- fiscal year ends 15 July.

(4) PCO compiles data and produces Rapti IRD Project Annual Progress Report during August-September.

(5) Regular monitoring reports are prepared by staff from the PCO and USAID/Nepal RD Office after completion of each field trip.

(6) Impact monitoring and evaluation data collected one, two, or three times a year by PCO, USAID/Nepal staff and consultants.

(7) Periodic project evaluations (two to three years) by outside consultants.

The information system is planned to support this process in Rapti IRD Project. However, there is no additional budget for most of this information system, as the activities are to be carried out as a regular part of the operations of the office.

The PCO has four staff members for financial monitoring and management and seven for planning and monitoring activities, whereas the USAID/ Nepal RD Office has a staff of nine, including three expatriates.

An up-to-date record of the project's activities is the main objective of the information system, but in practice the PCO's annual progress reports are not completed in time. Moreover, a lot of information concerning the details of project activities is not recorded.

Data collection in Rapti Zone may not seem difficult, but, due to the remoteness of the hill districts, the data cannot be transferred in time. A lack of qualified personnel is another cause of delay. People do not take the task of data collection and dissemination seriously enough.

The following are the main problems encountered in implementing the information system in Rapti IRD Project.

(1) The PCO does not have organizational control over the district level as well as central-level agencies because it cannot compel them to produce progress reports, planning documents, and other monitoring information on time.

(2) Some district-level officer-in-charge posts are vacant or filled by lower-level staff in an "acting" capacity, so responsiveness to project activities is very limited.

(3) Information concerning planning, monitoring, and financial matters is technical work. In the entire zone there is only one computer, which is in the PCO Office. All other offices must perform their data processing by hand with the aid of pocket calculators. This is why it is difficult for the PCO to obtain adequate data on time. A lack of proper instruments and equipment for rural construction projects has meant that these tasks could not be completed efficiently or on time.

(4) Although there are seminars and meetings held in different locations both within Rapti Zone and outside of the zone for Rapti IRD Project officials, and many people are sent abroad for different types of training, few people return to work in the Rapti Zone offices after their training is completed. Rapti IRD Project constantly suffers from inadequate human resources.

ORGANIZATION OF PLANNING/PROJECT MANAGEMENT SYSTEM AND THE INFORMATION SYSTEM

The organization of the Rapti IRD Project has already been described. The district-level officer-in-charge of each line agency is responsible for the content and the form of information collected by his office. But in the case of Rapti IRD Project, if any person sends incorrect information to the PCO or the Central Office, thereby hampering the implementation of project activities, no one is ready to take action against him. For example, at the end of fiscal year 1983/84 the district technical office in Rukum sent word to the PCO that the Machhmi Drinking Water Scheme was complete. On that basis a new project was planned for the following year, but in the second month of fiscal year 1984/85 the same office again sent word that the project had not, in fact, been completed. Due to the initial wrong information, the project planning strategy had to be changed, but no one was held responsible for providing the original wrong information.

The regular forms used in the information system are approved by the National Planning Commission, which has the responsibility of amending or changing them. Yet the forms are not well suited for the tasks of Rapti IRD Project computerized information system.

Essential information in Rapti IRD Project is not yet flowing smoothly. Although baseline data on Rapti Zone were collected in 1978/79 by the Agriculture Project Services Centre (APROSC), when the decentralization act went into effect district-level information was required in order to develop district profiles to facilitate district-level planning. For the district-level plan of 1986/87 this kind of information will be used. Rapti IRD Project will prepare village profiles for Rapti Zone in 1986. After profiles have been prepared for every village, a district profile will be drawn up.

Regular monitoring information flows through district-level offices or project site offices to the PCO and their parent offices (monthly, trimesterly, and annually), but information coming from field trip reports does not flow in an organized way. In the case of evaluations, a great deal of basic information can be collected from the project implementing agencies, and an evaluation can be made of the impact of the project and of its strengths and weaknesses.

Most of the data which flows through the Rapti IRD Project organization is of a baseline and monitoring type.

Rapti IRD Project's planning process seems ideal in theory, but in practice the planning involvement does not reach to the village level; it only extends down to the district level. The data which is collected by this system to some extent feeds back into the planning process in terms of indicating expenditure capacity, project implementing capacity, problem identification, and suggestions for improvements.

The field staff of the Agriculture Development Offices who work in different panchayats collect from the farmers such basic types of data as those areas planted with improved varieties of wheat, rice, and maize or the area treated with chemical fertilizer, etc. An alternative method of collection is by getting data from cooperatives and the Agricultural

Inputs Corporation Office concerning sales of improved seeds and fertilizer. The agriculture and livestock field staff have a regular monthly meeting at the district centres where they present the field-level data to their district officers. Data processing is carried out at the district office and then information is forwarded to the central level and the Project Coordinator's Office. However, as yet this data analysis system is not fully operational in Rapti Zone.

MEANS USED TO CREATE THE DATA AND INFORMATION BASE

Data which can be processed into information concerning the infrastructure of any particular area, or data about the feasibility of a particular project for a certain area are essential for planning. For example, if a plan for a drinking water scheme for Village A is being drawn up, data on water source differences in elevation between the source and the location of the village, the users and the transportation facilities available in the village, are essential. These kinds of data could be collected by updating village profiles together with the district profile.

In Rapti IRD Project the methods of data collection used are as follows:

(1) Panchayat surveys: Data to be used for planning purposes are collected by a village panchayat survey, e.g., in planning for the cropping systems programme, a site description survey of each concerned panchayat was carried out by an agricultural specialist. This survey helped in the planning and implementation of the programme.

(2) Special surveys by consultants: Special data concerning household production was collected on a contract basis by USAID/Nepal using a local consulting firm. This survey provided approximate data about the productive capacity of selected Rapti Zone households. Other such surveys have been carried out periodically.

(3) Some data have been collected by long-term expatriate specialists during their regular work in Rapti Zone. These data might be mentioned in their periodic or final reports.

(4) Data are assembled by processing the status reports of different components. For example, regular progress reports present these kinds of data.

(5) Data have been collected through the special effort of contractors and USAID/Nepal, e.g., Monitoring and Impact Assessment System for Rapti IRD Project, Rapti Zone Regional Assessment, Rapti Livestock Development Assessment, and evaluation reports, 1983 to 1985.

The data collected in field trip reports and regular progress reports are low cost as there is no need for extra expenses for this type of collection. The operating expenditure of the PCO covers the regular collection of such data. Some special types of evaluation study which have been carried out by consultants have required additional expenditure.

Data collected directly by line agency staff is more reliable than that which is collected indirectly from other sources and forwarded to the centre.

Up till recently the data received through this system were processed by hand. Now with a computer in operation, attempts are being made to process the data using the computer.

Rapti IRD Project has installed a radio facility in each district panchayat office, in the Project Coordinator's Office, and in the principal ministry, MPLD. Communications among the districts and the Project Coordinator's Office as well as with the centre are thus very good. These radio sets have made data more easily available in the Rapti IRD Project.

Resources such as relevant equipment as well as incentives for the people who are involved in data collection and processing are needed in Rapti Zone. In order to prepare village or district profiles the grassroots workers such as the village secretary, panchayat members, or Pradhan Pancha, should have training in data collection methodology and be highly motivated for the task. Village panchayat secretaries and field staff of different line agencies (e.g., agriculture, livestock, and education offices) should be trained in data collection, verification, processing, and analysis.

In Rapti IRD Project a simple filing system is the most common data storage method. But the Project Coordinator's Office and USAID/Nepal RD Office are trying to store data on computer diskettes. The PCO intends storing up-to-date physical and financial progress data from the line agencies. Files have already been completed for computer storage of data concerning the rural works project activities.

In the past it has been very difficult to retrieve data quickly with the regular filing system. It is to be hoped that the computer system will facilitate faster data retrieval. The results of the information system so far in the Rapti IRD Project are contained in appendix 1.

Data necessary for promoting rapid implementation are usually forwarded by radio to the concerned office, and other regular information is forwarded through project reports.

USE OF INFORMATION GENERATED BY THE INFORMATION SYSTEM

The collected data are largely incorporated into the decision making process, but for the planning process they are not yet fully incorporated. Examples of this would be the following:

(1) The 1983 progress report of Rapti IRD Project showed that the achievements of the education component were very low and that advanced money had not been cleared. The donor agency and the Ministry of Finance thus decided not to plan an education programme for 1984 and 1985.

(2) At the final stage of the following year's planning process the status of any ongoing project should be sent to the central level planning authority. The 1985/86 forestry plan of Rapti IRD Project for each forestry district-level office contained budgetary provisions for the construction of a new ranger office-cum-residence. It was assumed that the construction programme for the previous fiscal year would be completed. There was thus no provision in the plan and budget for the continuation of construction activities. Although construction activities were not completed, the information did not reach the centre so uncompleted work could not be continued into the next fiscal year. A new programme was sanctioned by the centre. This confused state of affairs existed purely because of scarcity of correct and timely information.

(3) In every annual progress report of the Rapti IRD Project, an attempt has been made to compel the Cottage Industry Office to revise its traditional training programmes. The agency has so far not followed these recommendations. At the time of the final evaluation of the Rapti IRD project, the team recommended that the cottage industry programme be dropped due to the unproductive nature of the training programme being organized.

Information from monitoring and evaluation procedures is not fully utilized in Rapti IRD Project management as the kind of information available is relevant to a higher level of decision making. The information is presented at annual and trimesterly review meetings and discussions with management personnel are held. However, the meetings have not been held on time and only inadequate information has been available. Therefore, the system could not function properly in support of the planning process.

TRAINING REQUIREMENTS FOR THE USE AND APPLICATION OF THE INFORMATION SYSTEM

Large numbers of people receive training from the Rapti IRD Project in-country as well as foreign training, and in a variety of subjects. Some of the training programmes are not designed according to the needs of the project and the demands of the trainees, but designed according to the facilities of the trainers and the slots which can be easily arranged. The training programmes of the Rapti IRD Project which have been completed so far and directly assist the information system are:

(1) Computer Training: Two personnel from Rapti IRD Project Coordinator's Office were trained in word processing, data base management, and other software programmes and a local consultant was hired for a period of nine months to introduce computer data base management and train PCO staff in computer use.

(2) Eight radio operators have been trained during the last three years. They are particularly useful for relaying information from the districts to the Project Coordinator's Office, or central offices and vice-versa.

(3) Training for JT/JTAs, viz., field staff of agricultural extension is being carried out regularly prior to cropping systems programme implementation in each panchayat. In this way the field staff are continually improving their reporting system.

(4) Planning seminars and review meetings are being held at the zonal and district level which are important venues for project information exchange.

The following personnel require training for the application of the information system:

(1) Village-level: Village panchayat secretary, field staff of agricultural extension and livestock offices.

(2) District-level: District-level personnel who are involved in planning and budgeting, and district-level accountants.

(3) Zonal-level: Personnel involved in planning, monitoring, and accounting in zonal-level offices.

The abovementioned personnel are, as yet, insufficiently trained with respect to their roles in the information system.

The following are the problems of training:

(1) Lack of properly qualified trainers.

(2) Training materials are not readily available for the training programmes in Rapti IRD Project.

(3) Identification of training needs by development workers is difficult.

(4) People having to do different kinds of work with inadequate educational backgrounds, for example village panchayat secretaries who have to accomplish different kinds of work (such as planning and implementing village-level projects, recording and reporting) cannot follow the training subject matter properly due to limited education.

(5) Training incentives are inadequate for both trainers and government sponsored trainees due to government regulations.

(6) Inability to provide training at the most appropriate times due to limited budget availability and shortage of trainers.

Within the midwestern region of Nepal there are three training centres. One panchayat training centre and an agricultural training centre are at Nepalgunj and a women's training centre is at Surkhet. These training centres are providing some local-level training facilities for Rapti IRD Project personnel.

AN EVALUATION: INDICATIONS OF EFFECTIVENESS OF THE INFORMATION SYSTEM

The information system which is in use in the Rapti IRD Project has already been mentioned. The project as a whole has achieved around 50 per cent of its target which is given in Appendix 2.4/ As of 1985, the total project expenditure was US$6.4 million (see Appendix 3).

Any kind of system should be changed according to the situation and time period in order to improve results. The Rapti IRD Project information system is not a permanent system but one in which components should be able to be changed according to new situations.

Since the beginning of the project, a great increase in the data collection capacity has been noted. Efforts to update information are continuous, having been ongoing since the project began, five years ago.

Living at a fairly low standard of living, government personnel involved in Rapti Zone are not highly motivated. The achievements of any organization depend upon the morale of its personnel. In the Rapti IRD Project no extra incentives except foreign training are provided to the personnel. Foreign training cannot be provided to everyone. As a result the Rapti IRD Project is also affected by low morale among personnel. To regularize the system and to keep records up-to-date, the commitment of the personnel has an important role in the second phase of the Rapti IRD Project which is scheduled to begin in mid-1987. These things should be carefully considered.

Clearly, the computer will be highly beneficial for the project in connexion with the information system. Moreover, the personnel involved in this work should perform more efficiently. The system which is being operated in the Rapti IRD Project area should be more reliable and helpful in the next phase of the project. It is to be hoped that the National Planning Commission will consider changing its formats and ways of collecting data in order to make it easier to computerize, and therefore, more useful.

NOTES

1/ See Annex 1 of the author's original paper prepared for the UNCRD Expert Group Meeting on Information Systems for Local and Regional Planning in Developing Countries, Nagoya, 16-19 June 1986.

2/ See Annex 2 of the author's original paper.

3/ See Annex 3 of the author's original paper.

4/ The main formats used in Rapti IRD Project information system are also given in Annexes 2 and 3 of the author's original paper.

APPENDIX 1. SOME IMPORTANT REPORTS AND MANUALS OF RAPTI IRD PROJECT

1) Annual progress reports, Rapti IRD Project, 1981-85
2) Impact Study of Water Supply Project, Rapti IRD Project, 1985
3) Rapti Zone Rural Area Development Project Mid-term Evaluation Report, 1983
4) Construction Management Manual, 1984
5) Training of Trainers Training Manual, 1984
6) A Handbook of Cropping Systems Extension Approach, 1984
7) Monitoring and Impact Assessment System for Rapti IRD Project, 1985
8) Rapti Zone Rural Area Development Project Final Evaluation Report, 1985
9) Winter Crops Reports, 1983-85
10) Summer Crops Reports, 1983-85

APPENDIX 2. HIGHLIGHTS OF RAPTI IRD PROJECT PROGRESS UP TO 1985

1) Agriculture:	- Out of 230, thirty-one panchayats are covered by the Cropping System Programme - 1,682 result demonstrations - 22 farmers days - 73 crop competitions - 47 exhibitions area covered by improved seeds and chemical fertilizer
2) Livestock:	- 4 new offices established - 25 new dispensaries - 78,000 animal treatments - 35,000 vaccinations - 89 improved buffaloes distributed - 104 improved goats distributed - 102 improved sheep distributed - 360 improved pigs distributed - 28,000 improved chicken distributed
3) Agricultural credit:	- credit volume in Rapti Zone grew from Rs 5 million to 14 million per year - 18 Small Farmer Development Programmes launched - Appropriate Technical Unit established
4) Agricultural Inputs Corporation:	- 1,000 MT capacity new warehouse - Two new offices established - 500 MT capacity warehouse renovated and updated
5) Irrigation:	- Two irrigation projects covering 877 ha of land to be completed - Two new irrigation projects have been started which will cover 718 ha
6) Road stabilization:	- Four nurseries established - Plantation on 95 ha
7) Soil Conservation:	- Ten nurseries established - Conservation afforestation on 170 ha - Thirteen gullies controlled - Seven canals improved - Three water sources protected - Two roads protected
8) Forestry:	- Thirty-nine nurseries established - Plantation on 862.7 ha
9) Production Credit for Rural Women:	- Six panchayats in five districts
10) Cottage Industry:	- 1,300 individuals trained

APPENDIX 2 (continued)

11) Education:
  - Improvement of 100 schools
  - 200 English teachers trained
  - 96 teachers trained in long-term, in-country training

12) Rural Roads:
  - Construction of 152 km of roads

13) Rural Works:
  - 3,295 people are benefited by 33 drinking water schemes
  - 830 ha of land irrigated by 13 small irrigation projects
  - 11 suspension bridges constructed
  - 3 wooden suspended bridges constructed
  - 7 mule-tracks constructed

14) Institutional Development:
  - 50 buildings constructed

APPENDIX 3. RAPTI IRD PROJECT EXPENDITURE UP TO 1985

(Rs '000')

1)	Agriculture	12,208
2)	Livestock	7,509.6
3)	Agricultural credit	
	Credit Access	766
	SFDP	1,558.8
	ATU	2,472.6
	Agri. Loan	6,842.5
4)	Agri. Input Corp.	2,486.9
5)	Irrigation	6,828.5
6)	Forestry	3,575.1
7)	Soil Conservation	3,523.7
8)	Education	3,201.1
9)	Cottage Industry	5,932
10)	Rural Roads	44,667.7
11)	Rural Works	1,232.9
12)	Institutional Development	
	Coordinator's Office	26,739.7
	Local Dev. Office	4,615.4
	Dist. Tech. Office	1,332.9
	TOTAL	135,293.7

USAID/Nepal
Direct Exp. US$ 6,416,677 (Approx: - 50% of the Agreement)

GRAND TOTAL: US$ 15,695,636

COMMENT

Teitaro Kitamura

At the outset, I should like to point out that how to get the information is a difficult situation in respect to planning an information system in situations where data is lacking, especially in developing countries. Since there is no system for statistics initially, and under these circumstances most of the personnel may not understand the planning process, one should scientifically design the information system along the two aspects of legitimizing the target and devising and implementing the means or procedures. In the situation where data is lacking, first it will be necessary to enlist the aid of village persons and officials to gather statistical data. Secondly, it is necessary to make a planning-oriented information system, perhaps initially as a manual system and then later on as one which would use computers.

In this regard, it is necessary that training focus on how to gather statistical data. An example from Japan is the use of the Agricultural Census, which utilizes a small Agricultural Statement Card to record statistics on agriculture activities. Entries on the card include statistical items such as number of farmers, areas, animals, and the like. This card becomes a kind of data bank for rural planning. Therefore, in the first instance, it is important that the villagers know how to enter the statistics. Once the procedure is established and understood at this basic processing level, then the system can gradually be computerized.

The next point concerns the suggestion that impact evaluation may be appropriate early in this work. One way to get around the difficulties of impact evaluation in developing countries would be to use a case study approach. One should begin with a trial plan for a small village or district and gain experience in planning and making targets. Probably one will soon recognize what methods are effective and what data are most important for planning work. Through such impact evaluation, there is opportunity to test data as to which is the most important and should be sought out in the future.

Finally, I would like to propose that basic manuals be prepared for this kind of case study work, including manuals for trainers. At the beginning these should be most simplified, then step-by-step made more complicated.

COMMENT

Hitoshi Yonekura

The qualitative or language information at the village level is particularly interesting in the context of the many problems and constraints on development in Nepal. The Agricultural Development Offices are exemplified as the basic offices for collection of data at the village level. The agricultural and livestock extension workers directly contact the farmers and villagers, as they have extensive and intensive knowledge and experience about the locality and various kinds of practices in the village.

This is similar to Indonesia where each village has an extension worker who lives in the village and everyday has contact with farmers and exchanges information about agriculture or other facets of daily life. In Japan also the extension worker has lots of information about the villages and communities, and he sometimes has very strong personal relations with local families, so much so that occasionally he may act as matchmaker for a bride and groom.

So at the bottom level, the extension worker in the village is a very useful source of information, and sometimes he will even know the people's attitude towards government programmes and policies. In Regmi's paper, the agricultural or livestock extension workers have regular monthly meetings at the district centre. This meeting must provide very important opportunity to collect grass roots information. Maybe in this monthly meeting statistical data, such as productivity, planning area, or agriculture imputs may be collected and combined. If those statistical data are not enough to understand the community-level situation, the informal or language data collected by each extension worker should be reported and combined at the district level. Data collected by the extension workers may be rather easy to input into a computer. Microcomputers have potential applications at the district level or for extension workers.

In regard to the language or qualitative information included in many kinds of reports (feasibility studies, implementation reports, operational or maintenance reports, monthly or annual progress reports, or even the village and district profiles mentioned in Regmi's paper), these should not only include the traditional information, but the possible conflicts within the village or conflicts between the district and the villages or even such things as judicial precedences concerning land expropriation by the government. Such data can also be very important for the promotion and implementation of rural development projects. The problem, though, is whether such data would be readily available in the manner it is stored in Nepal, and whether foreigners or consultants would be able to extract such information for post evaluation of projects or for learning the lessons of a project.

Documentation is a very important issue, since it will make computerization possible. In Indonesia where I had an opportunity to conduct village research, I sometimes found that some offices would stack reports and information in huge piles of project data, but there would be no completed index cards for such. Accordingly, any research required the direct review of the raw data without the aid of any systemized library assistance. So the inclusion of proper information infrastructure, such as an index card system for classifying data, is important to the smooth operation of rural development projects.

Finally, concerning decentralization in Nepal, if it is along the lines of normal meaning where decision making is handed over to the local government, there is some danger of the involvement of many pressure groups or influential persons who may interfere with the local government's decision making process. In planning it is very important to protect the consistency among the various policies or rationalities from the viewpoint of economics or the like. So the decision makers must be prepared to stand up against any irrational political pressures. Of course, sometimes compromise with the pressure or interference might be necessary, but consistency must be maintained in order to achieve the desired result of the plan.

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VARYING INFORMATION NEEDS FOR LOCAL AND REGIONAL PLANNING AND THEIR IMPLICATIONS FOR TRAINING

Hiran. D. Dias

The issue of information needs for local- and regional-level planning stems from the decentralization of planning. The level and nature of decentralization, particularly in the way it is practiced, varies among different countries.1/ Although conceptually we can determine various subnational levels to which planning can be decentralized, the level to which planning has actually been decentralized varies from country to country.2/ Further, the degree of decentralization in terms of decision making authority granted to the various levels, as well as the capacity at those levels to exercise that authority vary considerably. At the same time, although generally the financial and sectoral coverage of this authority is quite limited in most countries, it too varies among them. Next, the approach to planning also varies not only from country to country but within a country and at various subnational levels.3/ Finally, the decision makers themselves vary according to the country, the subnational level, and the planning approach. Normally, it is still the administrators who make most decisions at this level, but politicians, local leaders/elites, and people may also play a role in that order of decreasing importance. Clearly, therefore, it is unrealistic to visualize information needs for local and regional planning as a uniform set.

These variables form the framework of reference for determining the varying sets of information needs at different levels: Type of data, sources, methods of collection, reliability and accuracy, storage, processing, retrieval, and method of presentation. This is best illustrated with reference to a specific example. If we were trying to solve the problem of malnutrition in the country, it may be considered as a general problem relating to food scarcity, income levels, and income distribution. If everyone had sufficient income and there was sufficient food available in the country (either through production or imports), it is reasonable to assume that everyone could purchase enough food. In that context, if a macrolevel top-down planning approach is adopted, our information needs will be different from the case where a decentralized participatory approach is adopted, although some data will be similar in both instances. In the first instance it is necessary to know the national food needs and availability, income level required to purchase the minimum food requirements, and the number of persons whose level of income is below the minimum level. That would give us an idea of the national situation and indicate aggregate sectoral requirements against which to compare resources that need to be/can be mobilized at that level to meet these requirements. We can decompose these findings sectorally to the subnational level and repeat the national-level exercise at the subnational levels to determine the food requirements and production at each area, whether there is a surplus or a deficit at that level, how many people cannot afford to obtain enough food, what are the possibilities of raising their income through increased production or employment, and so on. At this level information on interregional flows of food is also needed. In the past, attempts were made to increase food production through policies to develop infrastructure, increase production and profitability, and so forth.

Information at the macrolevel would, therefore, be required on irrigation, roads, extension services, input supplies, and so on. Sectoral plans for particular areas are based on such information. As the size of the area becomes smaller the need for specificity in information needs increases, but only at the project level is the information required to be very specific. The development net, so to speak, is cast over a wide area, and what is caught within it is a matter of chance. The kind of data that agricultural sector planners worked with were aggregate extents of various crops at the local and regional levels, amounts of required fertilizer or seed, numbers of extension personnel, credit needs, extent of land irrigated, and others. Implicitly, information on land suitability (climate, soil, topography, and so on) must be taken into account to determine what types of food crops can be grown, although this might not be done systematically. Implicitly, also, information on market demand, marketing and transport facilities, cost of production and prices, and productivity must be taken into consideration. While these considerations affect food production and play a role in decision making, implicitly more than explicitly, they are rarely rigorously analysed for planning at this level in the top-down sectoral planning approach.

Under that sort of planning approach there is hardly any effort to consider who are the people who cannot afford an adequate food intake and attempt to ensure that their income will increase through increased production and employment. They are expected to benefit from the activities promoted by general policies and strategies. As a result, data providing that type of information are hardly collected.

Although some of the information requirements at different levels under a decentralized planning system would be very similar, there are important differences if the development philosophy and strategy are different. The people who are malnourished will be the direct target group if the objective is to solve the problem of malnourishment through participatory local-level planning. But the target group first needs to be identified, i.e., Who suffers from malnutrition? If the answer to this is sought on the basis of income, data on income or an equivalent indicator of malnutrition is needed. It is necessary to know the causes of their low income and how their income can be increased. If they are farmers, whose food production can be increased, information is needed on the causes of their low production and how to increase it. If they are landless agricultural workers, information is needed on whether agricultural development in the area will increase their incomes through additional employment and enable them to buy more food. Or else, could they start other enterprises to increase their income? What enterprises? Information is needed then on the facilities required and markets available for these enterprises. At this level it is important to assess the feasibility of these enterprises and the mechanisms and institutions through which they can be operated; information is needed on these aspects as well. Some of this information may be needed, implicitly for the macro-level top-down approach as well.

While the focus under the latter approach is microlevel, the individual cannot survive by himself/herself. All individual enterprises operate within a framework in which the individuals collectively interact with one another as well as with others. Information is required at the community, the village, and the local levels of aggregation. The impact of the interregional issues at these levels, and the information requirements need to be considered.

Through exploring this particular example, an idea can be obtained on how information requirements change with the level of planning and the planning approach. Although the objective remains to be the same -- to overcome malnutrition -- the questions that need to be asked and, therefore, the information needed, vary according to how one wants to achieve it. If this problem is examined in its entirety, even for just this one objective, taking the information needs under different planning approaches at various levels of planning from the household/farm holding to the relevant subnational unit through aggregation at the locality (group of households/farm tract), village, group of villages, and division/district, information needs are complex and not uniform. When several objectives/sectors are considered, which is normally the case in planning at the regional and local levels, the complexity is greater. An attempt has been made to identify the information needs using two different formats (Appendices 1 and 2),4/ but they are not fully comprehensive and do not differentiate the levels of planning, although implicitly they focus on the household and village levels.

If training needs to provide information for regional- and local-level planning are to be assessed, it is essential to determine what information these trained personnel must handle and who will be the people to be trained. These are interdependent: If a limited amount of fairly complicated/sophisticated data have to be collected and processed to prepare an area plan, a limited number of fairly well-educated and trained personnel are needed; however, if fairly simple and straightforward data must be collected from many sources to prepare a people-oriented plan with popular participation, several people with a lower level of formal education need to be trained, but with other advantages to compensate for this. The latter type of training will be required at the field level. Under certain planning approaches and for certain types of planning this category of training is not required.

Training in information needs for more educated and, sometimes, technically qualified personnel who normally function at higher levels in the administrative hierarchy is essential for all planning approaches and for all types of planning. In most countries this category of personnel gets some sort of training, although this training may not take sufficiently into account the requirements of the specific information needs they must handle. Their training tends to be more general than specialized. When training is considered from this point of view, different types of training programmes must be considered for personnel operating at various levels, according to the types of information they handle. Some of this information is of very technical nature and can be handled only by technically qualified personnel.

Presumably our concern is mainly with training on socioeconomic information needs, but planning at this level, more than at higher levels, requires the interaction of technical and socioeconomic variables. An important aspect of training at this level, therefore, must be on how to handle this interaction: For instance, in agricultural development planning, socioeconomic conditions must be related to natural conditions and spatial issues so as to determine more suitable farming systems and land use patterns and to formulate projects suitable not only for the area but also for the people. Fortunately, microcomputers have brought this possibility within the economic capacity of the local level, but software capability and trained personnel are limited. L. S. Yapa5/ at the Division of Human Settlements Development (HSD), Asian Institute of Technology (AIT) has been developing a package for this, utilizing existing software, and a one-month course for a group of district-level integrated rural development (IRD) personnel was held in July 1985 to train them in its operation. A brief description of this is provided in Appendix 3. In developing this, the existing spatial, statistical, and word processing software has been adapted and combined to help answer questions planners ask at this level. Such work is obviously being done in other places also, and the technical capability to handle data and analyse them for use in planning at this level should develop rapidly in the next few years. One aspect of training, therefore, is the need to prepare planners to use this capability. This would have important implications for data gathering and handling also.

Another important software package being developed by Detlef Kammeier also of HSD/AIT, deals with locational decisions relating to services. A brief description is provided in Appendices 4 and 5, but more detailed information is contained in two papers prepared by him.6/ AIT and the United Nations Centre for Human Settlements (UNCHS) (Habitat) held the Workshop on Microcomputer Applications to Human Settlements Planning and Management at AIT from 18 to 29 August 1985. AIT is the appropriate institution for this work because of its well-developed computer capacity (including mini- and microcomputers), trained computer personnel, a strong planning division oriented towards rural, urban, and regional development, and its Centre for training in remote sensing and natural resource survey and development.

NOTES

1/ HSD/AIT is sponsoring a research project on Decentralization: Area Planning in Practice in Asia, through the Rural and Regional Development Network (RRDN) set up under its project in cooperation with the Institute of Social Studies (ISS) in the Hague; the research is to be carried out in Bangladesh, India, Indonesia, Nepal, Philippines, Sri Lanka, and Thailand.

2/ Several terms are used in different countries to refer to the various subnational administrative units, i.e., state/region, province, district, subdistrict/division, group of villages, village, locality, and household. These are not uniform, and the term used in one country for a particular level in the hierarchy of units may be used in another country for a different level or unit.

3/ It can be comprehensive, regional, target group oriented, sectoral, felt-needs based, top-down, participatory planning, and so forth.

4/ Appendix 1 is from "Information System for Local-Level Planning: A Study in Hambantota District, Sri Lanka," by Hiran. D. Dias and W. M. Leelasena (HSD Working paper; no. 11) (Bangkok: AIT, 1983). Appendix 2 is from Annexure III (Identify Research Needs (in General) in the Process of Rural Development) of Consultancy Report for LFN/LIPI Project on Application of Appropriate Technologies for Rural Areas -- Phase II, by Hiran. D. Dias (1986).

5/ L. S. Yapa from the Department of Geography at Pennsylvania State University is spending a year at HSD/AIT under the AIT/ISS Project.

6/ H. Detlef Kammeier and Barjor E. Mehta, "Microcomputer-Based Evaluation and Planning Tools for Rural Center Development in Third World Countries" in Computer Environment Urban Systems 10 (2:1985); and H. Detlef Kammeier, "A Microcomputer Based Assessment of the Accessibility of Central Place Services," Asian Geographer (September 1986).

APPENDIX 1. INFORMATION REQUIREMENTS AND AVAILABILITY

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
(1) Low-income families	Number of families with income: a) Rs 300/- below b) Rs 300/- to Rs 500/- per month	Identity areas with severe poverty conditions, i.e., areas with more than district average (65%) below poverty line	Family income	GM Division	Yes	(1) Food stamp scheme. GS Office, AGA and Food Dept.
			Number of members in the family	Household	Yes	(2) Voters list and census report (1981) - Election Dept. and Dept. of Census & Statistics
(2) Do they own/operate adequate means of production?	What are their means of production capacity to generate income?	Assess whether the available assets (with feasible improvements in utilization) can generate income above poverty line	Size and condition of production unit (land holding; type of vessels; fishing gear; type, number and capacity of industrial equipment; type and number of livestock; and other income generating assets)	Household	Yes	(3) Agriculture implementation programme - Food Production Branch (4) Land utilization record - Dept. of Agriculture (5) Agricultural statistics - Dept. of Census & Statistics (6) Fisheries extension statistics - Dept. of Fisheries (7) Livestock information - Dept. of Ani. P & H (8) Small industries information - Dept. of Small Industries and Dept. of Textiles
No Yes		Consider what additional assets are required to increase the income above poverty line	Type of ownership, conditions of sharing benefits, and conditions of operating	Landholding/ Household	Yes	(9) Landownership tenure records - Dept. of Land Commissioner
		Consider possible more productive alternative uses of assets				
(3) Do they get the potential productivity possible?	Shortfall in potential productivity	Estimate the potential increase of productivity	Existing and potential changes in land use/production systems	GM Division	No	
			Possible attainable productivity under various conditions	GM Division based on village sample	No	
			Present productivity under same condition	Sample can be selected from step 2	Yes	(10) Agriculture implementation programme - Food Production Branch

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
			Conditions prevailing in the area with an impact on productivity (rainfall, water, soil temperature, and groundwater)	(Same sample can be used for monitoring and evaluation)	Yes	(11) Climatic data - Meteorological Stations, Irrigation and Survey Depts. and Water Resource Board
No			Existing production techniques and potential improvement in techniques	Type of economic activity	Yes	(11.1) Agricultural research reports; Industrial Development Board; Fisheries Research, etc.
(4) What causes low productivity?	Constraints to high productivity	Eliminate constraints	Natural conditions affecting productivity (cf. under step 3)	GM Division	Yes	(12) Crop insurance data - Crop Insurance Board
			Tenure status of families under step 2	GM Division based on village sample	Yes	(13) Landownership and tenure records - Dept. of Land Commissioner (4.9)
			Availability and access to information	Sample can be selected from step 2	Yes	(14) Basic villages statistics - Dept. of Census & Statistics. Village Survey statistics - District Planning Unit, Hambantota
			Availability and access to inputs	Household/G.M. Division	Yes	(15) Records of Depts. of Agrarian Services, Agriculture, and Fisheries
			Profitability (cost and income)	Type of economic activity	Yes (for agri.)	(16) Cost records - Extension Division, Dept. of Agriculture
			Transport (distance to market, and mode of transport)	Household/GM Division	Yes	(17) Bus routes data - Regional Transport Board
			Marketing arrangements (cf. step 3)	Household	No	
Yes			Data required on management and technical know-how	Household	No	
			Institutional arrangements and policies to eliminate risk	GM Division	No	

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
(5) Do they get an adequate return?	Shortfall in potential return	Find out ways and means to increase profitability through minimizing cost of production, increasing prices, adding value to products through processing and improving the quality	Unit cost of different methods of production	Type of economic activity	No	
			Market imperfections	- do -	No	
			More economic production organizations	- do - ; GN Division	No	
			Difference in prices between producer and consumer	Type of product	Yes	(18) Weekly retail price records - Dept. of Census & Statistics (19) Purchasing records - Marketing Dept. Same as No. 18
			Price fluctuations	- do -	Yes	
			Available technology for processing	- do -	No	
			Value added by processing	- do -	No	
			Utilization of by-products	- do -	No	
(6) Unemployed/irregularly employed	Extent and nature of unemployment/underemployment	Assess and identify families and areas with severe unemployment problems Assess the availability of manpower for further employment within/outside the area	Number of employed in the family with age, sex, occupation, education, and skills	Household	No	(20) 1981 Population Census Report. Dept. of Census & Statistics collects but not available on household basis
			Number of unemployed above 15 yrs. of age in the family by age, sex, education and skills	- do -	No	- do -
			Number of unemployed above 15 yrs. of age willing to work within/outside area by age, sex, education, skills, and time available for employment	- do -	No	- do -

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
			Production assets/labour ratio for different production systems and techniques (cf. step 2)	Type of economic activity	No	
(7) Why are they unemployed?	Labour demand and supply; potential capacity to generate employment in different sectors	Find out ways and means of generating employment opportunities	Number of employed in different sectors	GM Division/ AGA Division	No	(21) Annual employment records - Dept. of Labour for AGA Division
		Assess employment potential in various sectors	Existing production techniques (cf. under step 3)	Type of economic activity	Yes (for Agri.)	(22) Agricultural extension records - Dept. of Agriculture
					Yes (for Agri.)	(23) Fisheries extension records - Dept. of Fisheries
			Existing labour intensive techniques	Type of economic activity	No	
			Production norms for different sectors under different techniques	- do -	Yes (only for Agri.)	Same as No. 16
			Availability of land, water, and other resources (cf. step 3)	GM Division	Yes	Same as Nos. 9, 11, and 14
			Possibilities of further processing (cf. step 5)	Type of crop	No	
			Availability and capacity of vocational training facilities	GM Division/ AGA Division	Yes	(24) Depts. of Small Industries, Labour, and Rural Development
(8) Poor housing; overcrowding; insufficient land for housing	Quality of housing Housing population ratio Landlessness for housing	Assess housing needs of the people and identify necessary programme to meet these needs	Type and number of housing: 1) Permanent 2) Semipermanent 3) Temporary 4) Area	GM Division	Yes	Same as No. 20
			5) Ownership		Yes	Same as Nos. 14 and 20
			Available facilities	Household	Yes	Same as Nos. 14 and 20

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
			Availability and type of latrine	- do -	Yes	Same as Nos. 14 and 20
			Number of members in a housing unit	- do -	Yes	Same as No. 20
			Pattern of ownership of land for housing	Different area basis	Yes	Same as No. 20
			Capacity of the people to meet the cost and maintenance of housing	Household	Yes	Same as No. 3
			Low-cost housing technology	Type of technology	Yes	
			Barriers utilizing existing scheme of housing assistance		Yes	(25) Data of Sarvodaya & Redd Barna RDSS
			People's perception of their housing needs	Household	No	
(9) Inadequate health facilities	Assess the need for health services in the area and quality and distribution of available service, and identify beneficiaries of the service	Assess the adequacy, quality, and beneficiaries of the service, find out constraints for better service, and improve the quality and distribution of the service	Number and type of institutions serving area	GN Division	Yes	(26) Health services records - PHI records - Dept. of Health Services - MOH Office & District Hospitals
			Number and different grade of personnel employed in institutions	Different area basis	Yes	Same as No. 26
			Bed/population ratio	- do -	Yes	(27) Records of hospitals - Dept. of Health Services
			Doctor/population ratio	- do -	Yes	Same as No. 27
			PHI/population ratio	- do -	Yes	Same as No. 26
			MMW/population ratio	- do -	Yes	Same as No. 26
			Distance to nearest health centre	GN Division	Yes	Same as No. 14

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
			Number of different clinics and patients attending	- do -	Yes	Same as No. 26
			Disease pattern	- do -	Yes	Same as No. 26
			Infant mortality rate	Different basis	Yes	Same as No. 26
			Maternal mortality rate	- do -	Yes	Same as No. 26
			Nutritional status of children and mothers	Household	Yes	Same as No. 26
			Percentage of children immunized for different diseases	- do -	Yes	Same as No. 26
			Staff strength in various campaigns	Area basis	Yes	Same as No. 26
			People's awareness of their health requirements and utilization of available services	Household	No	
(10) Low level of education/ignorance; lack of innovation; non-school attendance	Level and quality of education; attitude to education	Assess the quality and level and find ways and means to improve the level of education	Number and grade of schools	GH Division	Yes	(28) Records of Dept. of Education
			Number, size, and type of buildings	- do -	Yes	Same as No. 28
			Other facilities	- do -	Yes	Same as No. 28
			Capacity and number of students	- do -	Yes	Same as No. 28
			Average attendance and different grades			
			Number of teachers and their qualifications	- do -	Yes	Same as No. 28

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
			Teacher/student ratio	- do -	Yes	Same as No. 28
			Number of school-age children	Household	No	
			Number of attending schools	- do -	No	
			Average distance to school	- do -	No	
			Population according to level of education	GN Division	No	
			Occupational structure (cf. step 6)	- do -	Yes	Same as Nos. 20 and 21
			Number of migrated from the area	- do -	No	
			Needs of the area for vocational training	Household	No	
			Parents' attitude towards children's education	Household	No	
(ii)Unsatisfactory domestic water supply	Availability of and access to good drinking water; water for domestic purposes	Find ways and means to supply safe water for domestic use	Source of drinking water	GN Division	Yes	Same as No. 14
			Availability of drinking water during dry season	Household	No	
			Distance to source of water	- do -	No	
			Ground water condition	GN Division	Yes	Records of Water Resource Board
			Water borne diseases (cf. step 9)	- do -	Yes	Same as No. 26
			Requirement of water for domestic use	- do -	No	

APPENDIX 1. (continued)

Problem Identification	Information Needed	Objectives	Type of Data to be Collected	Aerial Unit	Data Availability	Source
(12) Disunity, crime, and other social illnesses; lack of popular organizations; lack of of good qualities	Social barriers to development	Find out barriers to unite people and strengthen community feeling and utilize that for community development	Number and type of voluntary organization	Village basis	Yes	(29) Dept. of Rural Development, Sarvodaya & Redd Barna
			Number of members in these organizations	Institution basis	Yes	Same as No. 29
			Objectives of these organizations	- do -	Yes	Same as No. 29
			Type of community work and voluntary orgnization contribution	GM Division	Yes	Same as No. 29
			Number of Shramadana	- do -	Yes	Same as No. 29
			Number of GM			

ABBREVIATIONS:

No. - Number
GM - Gramodaya Mandala
GS - Grama Sevuko
PHI - Public Health Inspector

AGA - Assistant Government Agent
Dept. - Department
MOH - Ministry of Health
MMW - Midwife

Ani. P & H - Animal Production & Husbandry

APPENDIX 2. IDENTIFICATION OF RESEARCH NEEDS IN THE RURAL DEVELOPMENT PROCESS

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
1. POVERTY	- National poverty line - Poverty line in the area - Target/poverty groups - Unemployment	- From literature - Check the income and expenditure, consumption of basic needs, and regular/seasonal employment through socioecon. survey	- Living conditions in the community area - Income sources and employment problems; for better understanding of income levels and expenditure research would be required - Causes of poverty in the community area	- Improve the quality of life - Increase income	- Increase production - Generate employment - Improve health and education - Increase participation - Increase motivation - Fulfill felt needs	- Possibilities to increase income from employment - Receptiveness to change and kind of activities people like to/can do - What are the people's felt needs?	- Information on specific sectors listed under them - Socioecon. survey can provide data on felt needs, interests, and capabilities	- How to motivate people to do other activities or change their activities/attitudes - How to select activities/technologies that suit people and their capabilities
2. NUTRITION	How many and who are malnourished? Dietary habits and beliefs	- Measure and weigh people - Visual indicators of malnourishment - Typical daily diet - Food preparation - Food storage - Awareness of nutritional needs - Who, when and how they eat	- Nutritional value of diet - Beliefs and preferences about food	Improve the nutrition intake	Increase food intake to required levels by: - Giving information formally and informally - Working together with PKK group Increase the availability of food by diversifying agriculture and home garden cultivation	- How to improve present diet - Affordability of proposed diet - Inf. of the standard KP consumption - List of food available locally that can be sources of KP minerals and vitamins - Way to select, prepare, and store food properly - Changing the food habit - Any resistance to proposals - Good home garden other landuse management - What nutritious food items can be incorporated into the diet - How can they be processed for consumption/storage	Check what is available and cost of others Check with local people Check with people	Assessment of locally available food items to: - Improve diet food preparation - Maximizing use of food sources available locally - How to overcome resistance - make food items acceptable - Need agricultural experts to check suitability of cropping system - Food processing research

APPENDIX 2. (continued)

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
3. HEALTH	General figures of health need to know conditions - Specific health problems - Incidence of illness in families in past 3-4 months - Awareness of preventable illness - Housing conditions - Environmental sanitation - Drinking water sources/habits - Domestic water source - Water disposal - Easily curable illnesses - Children cleanliness - Family planning response, awareness, and attitudes - Availability of FP supplies/services	Some externally visible indicators can be observed directly - Check the local health centre records - Check with families on incidence of illness - Awareness of preventive measures - Incidence of common illness - Awareness of simple curative measures - Observe children - Check practice of hygiene habits - Check with people - Acceptors - FP contraceptive use - Awareness attitudes adoption - Check with local FP personnel	For some illnesses, infections research needs medical expertise Effects of housing conditions, hygiene, and sanitation Awareness of effect on health View and attitudes on FP Difficulties in obtaining/use of supplier/services	Improve health and sanitation - house - water source	- Providing good water source system - Increase awareness of health needs - Improve environmental sanitation - Improve practice of personal hygiene - Prevent spread of disease - Promote cultivation and use of medicinal plants for simple illness	- Availability of sources - Possibility of simple methods to improve quality of water - Resistance to changes proposed - What is easily preventable - How to prevent - What is easily curable - How to cure - What medicinal plants grow/can be grown in the area	Check sources and what methods are possible - Check people's attitudes to change - Check with medical experts for preventive measures - How to treat common illness and minor injuries - Check with local people what medicinal plants are grown/used in the area	- Quality needs testing - Acceptability needs to be researched - How to overcome resistance - Rainwater storage for domestic use - Use of locally available medicinal plants for simple illnesses/injuries
	To the specific target group:			Improving their environmental conditions	- Increase awareness of having hygienic home environment related to: . House condition . Garbage disposal system . Food storage and preparation system . Water usage	- Simple and hygienic methods to do this	- Check sources and what methods are possible - Check directly what potential is available	- Improving house design and materials - Damp proofing houses, and treating bamboo for longer use - Use of garbage as animal feed/manure - Food storage and preparation - Rainwater storage for domestic use
	1. Housing condition	- Check the physical housing conditions						
	2. Garbage disposal system	- Can ask the family						
	3. Food store and preparation system	- do -						
	4. Family water source	- do -						

APPENDIX 2. (continued)

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
4. AGRICULTURE	. Landholdings - landuse - cropping system - productivity - problems	Information on size of holdings, tenure, crops, etc. can be collected from people, research, and local leaders		Use agricultural resources more efficiently Best cropping pattern during year	Bring new land, if any under cultivation	- Is there uncultivated land that could be cultivated?	Check with people, local officials, maps, and aerial photos	
	. Soil condition/ category (gravel, sand, and clay) - erosion - fertility - adequacy	Maps if available; farmers, people, and agric. officers can give qualitative information	Soil test to get more precise data			- What is the land suitable for?		- Land capability assessment; socio-economic feasibility of possibilities
	. Topography area - slopes - drainage - cultivability	Maps, aerial photos, and observation	Land suitability					
	Rainfall - distribution - reliability - area	Meteorology dept., agric. agencies, and local people's perception of rainfall	Analysis of rainfall data for reliability and variability					
	. Irrigation - availability - sources - adequacy	Irrig. dept. can provide information on existing facilities; farmers can say about access to irrig. water, adequacy, and problems	Profitability of existing cropping system Cost of production studies	Get more nutrition for community from agriculture	Diversify crop production and integrate livestock fish farming into farming system; conduct demonstration plots	- What new crops/cropping system can be introduced?	Agricultural officials	Develop new farming systems and examine their economic feasibility
	. Profitability of farming - costs - prices - fields	Production, cost, and sale figures can be obtained from survey		Increase employment in agriculture sector	Improve agricultural methods and intensify agric.; conduct demonstration plots	- What improved methods of cultivation are suitable? - Do they know how to use new methods/look after new crops/livestock	Check with farmers' difficulties in using improved methods Check with people and agric. officers	Test improved methods
	. Input - practices - sources - problems					- Do people have enough capital for new inputs/crops?	Check with people	
	. Extension services - effectiveness - problems	Frequency of meeting, type of advice, and case of access			Strengthen extension service with local trained volunteers	- Willingness and possibility to be trained as local volunteers	Check with qualified young farmers Check procedures with bank officials	
	. Credit - need - sources - problems		Problems of getting loans and loan recovery		Facilitate loan procedures	- Do people have enough capital for new inputs/crops?	Check with people	More effective ways to supervise credit utilization Promotion of local savings/credit organization
	. Markets - demand - channels - tie up with credit - problems	- How much, to whom, and where farmers sell - Prices paid - Marketing problems	Marketing system and how it affects prices for producers		Provide market information; improve access to markets	- Demand potential and market access		Group approach to marketing, market surveys

APPENDIX 2. (continued)

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
	Labour use, cost, and availability	How much labour is used, for what operation, and when	Labour utilisation studies	Increase income from agriculture Make agriculture more profitable	Intensify existing activities Start new activities	What are the possibilities to intensify/diversify		Labour absorption studies - assessment of impact of agric. intensification/diversification
	Harvesting/Post-harvest methodology, and problems	Check what methods/equipment/tools are used; awareness of problems; who does the work, how is it done, how much of produce is processed, and cost of processing	Losses of product (quality and quantity) from existing method	Reduce harvest/post harvest losses; improve product. quality/volume	Create awareness of problems; improve harvest/post harvest methods/equipment/tools; develop post harvest processing	Who needs information; what alternatives are available; Acceptability, costs and benefits of available alternatives	Check through survey, agric. officers and information unit	Studies to check acceptability, costs and benefits
	Organisation of work Scale of operation							
5. LIVESTOCK/ POULTRY	- Livestock needed - Space used - locally available livestock feed - Current markets - Support services available - Livestock consumption & production - Problems	Data from farmers, agricultural (livestock) agencies, socioecon. survey, field observation, and local records		Possibilities of increasing production to earn income and improve nutrition	Improve livestock poultry raising methods; introduce to newcomers Diversity crop production; integrate livestock farmers/fish farming into agricultural system	Who are interested in livestock/poultry raising? Do people have enough capital for livestock/poultry? Do they know how to raise livestock/poultry? What support is necessary? What is the market potential? Is there enough livestock feed locally?	Collect data through socioecon. survey on interest, knowledge and capacity of people	Develop new methods for livestock/poultry raising that are economical in scale and examine feasibility Market studies; local feed availability studies/possibilities of producing food locally
6. FISH FARMING	Consumption and production of fish	Estimate extent, prod., dam cons., sale, cost, and income from socioecon. survey	Cost of production studies	Possibilities of increasing fish production	Introduce fish farming to more people, especially those with little land but suitable for fish ponds	Who are interested in fish farming?	Check people's interest, land suitability, knowledge, and requirements through survey	Check suitability of available land
	Extent of profitability of pond area			Increase income and improve nutrition	Improve fish farming methods	Do the people have capital for fish farming? Do they know how to use and manage new methods?		Develop new methods of fish farming system and examine their economic feasibility
	Marketing possibilities	Estimate market demand from above data	Methods of production and problems					
	Support services available - current practice	Check with people and fish farming/agric. officers				What support services do they need? What and where is the expected demand?	Check possibility of improving support services	Market studies to assess future demand Possibility of processing to add value/preserve

APPENDIX 2. (continued)

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
7. CAPITAL	- Target groups - Indebtedness - Sources of capital utilized - Existing conditions for informal credit - Credit institutions and procedures - Problems of getting capital from credit institutions/informal sources	- Identify TG from socioecon. survey data - Local officers/leaders can give information about formal credit inst. and procedures - Check with people through socioecon. survey about indebtedness, credit needs and problems	- Procedures and problems to borrow money from formal credit institutions - Problems in repayment of loans - Difficulties of the target groups in getting credit	- Make capital required for proposed activities readily available at reasonable rates - Ensure repayment of loans	- Give information about credit institutions and procedures to borrow money - Encourage people to borrow from bank or credit institutions - Use one's capital more profitably - Organize easy access to credit - Organize easy repayment - Group responsibility for borrowing/repayment	- Ways of using and managing the capital - How to manage the work/activity properly - Facilities in the credit institutions; how can they be made more easily accessible? - What are the credit needs of the project/target groups? - Who needs credit and what are their chances of borrowing and capacity to repay?	- Check with credit institution officers	- Why people are not using formal credit facilities - How to encourage people to use formal credit facilities
8. TRAINING & EXTENSION	- Target groups to be trained - Level of education - Skills already available - Values/habits that need to be changed - Adequacy of existing facilities/programmes for training and extension	- Identify TG from socioecon. survey data - Check from people through socioecon. survey - Check with local officers and leaders for existing facilities/programmes; with people for adequacy with regard to content, timing, method, etc.	- Ability to manage values/habits that need changing to make developmental changes possible, and effectiveness of training methods that need research	- Improve the skill to operate and manage project activity - Improve effectiveness of training and extension - Increase willingness to innovate	- Give information needed - Increase awareness and understanding of project needs - Demonstrate new methods/technology of operation and management - Make them realize the need for change - Provide project related advice and training to TGs selected for specific project activity - Train local people to advise and assist TGs - Strengthen training and extension facilities	- The needs of TGs for project related skills - Current awareness and skills/required knowledge and skills for project activity - Problems relating to project - Times/places suitable for training/extension support/demonstration - Persons suitable to train as local extension agents - Persons willing to undertake demonstration projects	- Socioecon. survey can provide some of the information - Project specialist must advise on required skill and knowledge	- Suitable training methods to select local extension/agents/volunteers - Simple but effective management methods/record keeping

APPENDIX 2. (continued)

Area of Rural Development	EXISTING CONDITIONS			IMPROVEMENT DESIRED				
	Information Needed	Can Collect Directly	Research Needed	Objectives	What Should be Done to Achieve Objective	Information Needed to Formulate the Project	Can Collect Directly	Research Needed
9. IMPLEMENTING PROGRAMMES AND PROJECTS	- Social structure and institutions, social status/role, and values/habits - Existing implementing organization - How effective is it? - Who benefits from it? - Can target groups benefit from it? - Are there any social constraints to the proposed activities?	- Much of the information can be collected from the leaders/local officers through survey/interview	- Who has benefited from past dev. activities; how local institutions perform; who controls decision making power/institutions, local power structure and social organization, and values/habits that require research/action research	To implement projects effectively To give benefits to target groups	- Improve extension - Use existing channels of communication there - Formulate projects according to needs/capabilities of target beneficiaries - Form activity/interest related small groups to improve communication and project implementation - Provide necessary training and support - Monitor progress/problems regularly - Strengthen weak groups/individuals	- People's interests - Condition of the area - Skills/technology people have - Problems and constraints - Wants and needs/level of awareness - Existing groups/activities - Interest/activity groups - Interacting groups - Training needs - Support needed	- Check through socioeconomic survey and observation/interview local officials/leaders	- What programmes and projects are suitable to the people? - What methods are suitable for extension, so that group formation and project implementation can be found through action research?
	- Channels of communication	- Ask the people how often they contact the local leader, who they contact, and how they get information	- The informal leader/opinion leader's role - Understanding the way the community functions					

APPENDIX 3. EXAMPLES OF THE USE OF MICROCOMPUTERS IN REGIONAL PLANNING

Use of a Mapping Package in Planning and Monitoring

The use of microcomputers in regional planning is an area of research in which the Division of Human Settlements Development at AIT is currently concentrating. One project that is under way is aimed at introducing the use of microcomputers in Sri Lanka at the district level for IRD planning and monitoring. This is being done for the Katuwana Assistant Government Agent (AGA) Division, in Hambantota District in southern Sri Lanka.

The first phase of this project is divided into two distinct areas:

(1) Developing and testing interactive computer programmes, which are basically supporting and linking programmes, to the software packages used, namely, Autocad and SPSS/PC; and

(2) Running the software packages and the analysis of the results.

Developing the Supporting and Linking Programmes for the Software Packages

As a sophisticated package with respect to its functions and operational knowledge, Autocad demands that its user be a competent programmer and thus requires a great deal of training before being put into effective use. The primary objective here is to develop a communication link between the user and the software package, in which the user will be answering simple questions related to planning decisions in an interactive mode which would be converted into the form required by Autocad and passed to it through a linking programme. This reduces the extent of training required by the user. Furthermore, the programmes developed are generalized for adoption in any area.

Conceptualization and Application to Katuwana AGA Division

The programmes developed will be tested in application to Katuwana area.

Objective: Use Autocad to produce a map of the Katuwana AGA Division, showing its administrative subdivision boundaries, road network, and geographical features, such as lakes.

Input data: The basic data to be fed are the map coordinates with respect to a specified origin. This was done by digitizing the map, using a Digicom digitizing tablet, coupled to an IBM/PC/XT employing the software Earth Resources Data Analysis System (ERDAS). ERDAS is a digital image display and processing system based on the IBM/PC/XT. The system is designed and marketed by ERDAS, Inc., Atlanta, Georgia, U.S.A., and consists of both hardware and software components. Although the system is relatively inexpensive, it provides a wide range of functions necessary for image analysis through remote sensing.

The map of Katuwana AGA Division was digitized, using ERDAS, and this is the raw data file read by the linking programme. This linking programme, which operates in an interactive mode, enables the user to answer questions concerned with the study area under consideration. The output of this linking programme is then fed into Autocad as its input file.

Figures A3.1-A3.4 shows drawing produced using the linking programme and Autocad.

Special Features

The role of Wordstar, a word processing programme, in this process is noteworthy. It could be classed as the central programme which links the output of package as the input to another. All data files are created on the nondocument mode of Wordstar. Further, Wordstar enables easy reporting by enabling us to combine text with tables, maps, charts, and so on. All these can be prepared on the special features of this software and stored to be inserted into reports at appropriate places.

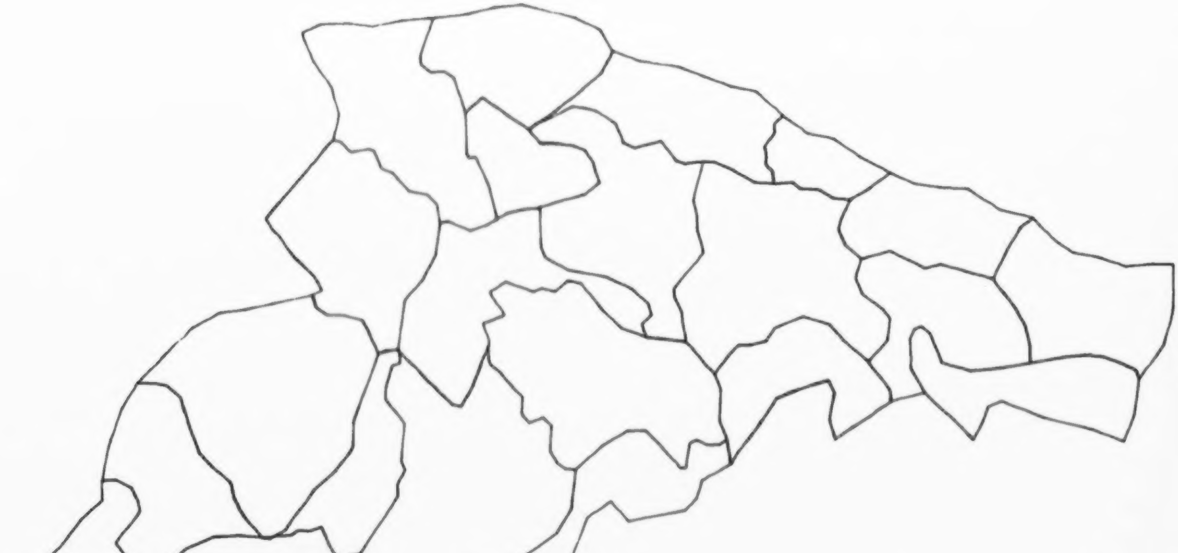
The layer concept of Autocad, which enables different details and data to be stored in separate layers is advantageous in the analysis of a complicated system. For example, in the case of Katuwana AGA Division, the administrative subdivision boundaries, the road network, and the lake were stored in three different layers. Other information on such things as service facilities, land capability, land use, and socioeconomic data can be similarly stored. Data in raw form can be inputted and processed in the various ways required by using the SPSS/PC package, and these can be presented as crosstabs, graphic charts, or as the output of a frequency or regression analysis. Conceptually, it is possible to find out how much unutilized land of a specified quality is available for the whole area or any part(s) of it, and to show on a map where it is located; by comparing this with road or irrigation networks, or other facilities (spread in other layers), it is possible to see the spatial relationships between them. There are many such conceptual capabilities that need to be developed as programmes, partly stemming from the ability to superimpose layers containing different sets of data/information in the combinations desired.

Hatching, texts, zooming, and script are other functions which make Autocad an ideal tool for regional planning. The zooming capability of Autocad also enables work at different scales from the district down to the village and even farm plot level. Information can be entered at any of these levels to get macro- and microlevel situational pictures.

Hardware Components

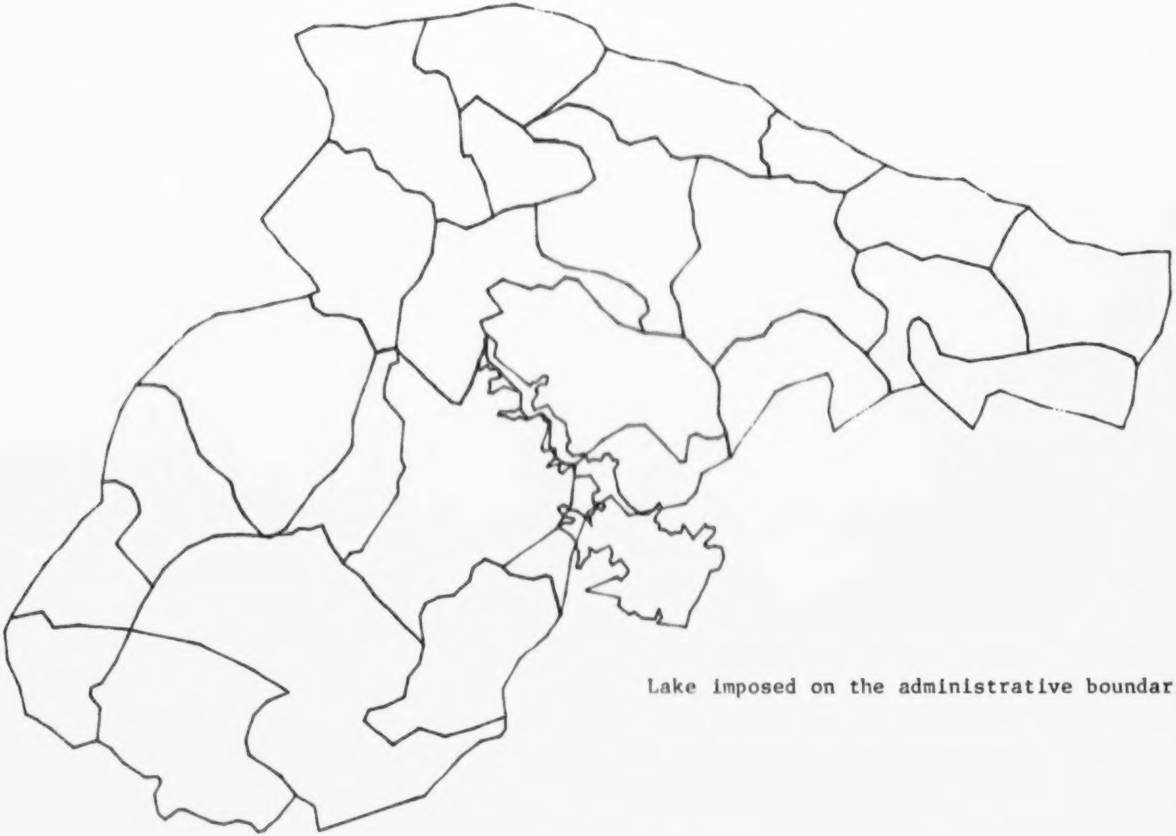
All computer programmes and the software packages are run in a double drive IBM/PC with a hard disk of 640k memory and 20M disk space. Peripherals used are an Epson-80 matrix printer, a Houston Instruments DMP29 8-pen plotter, and Digicomp digitizing tablet, all readily available commercial products.

Figure A3.1 Katuwana AGA Division



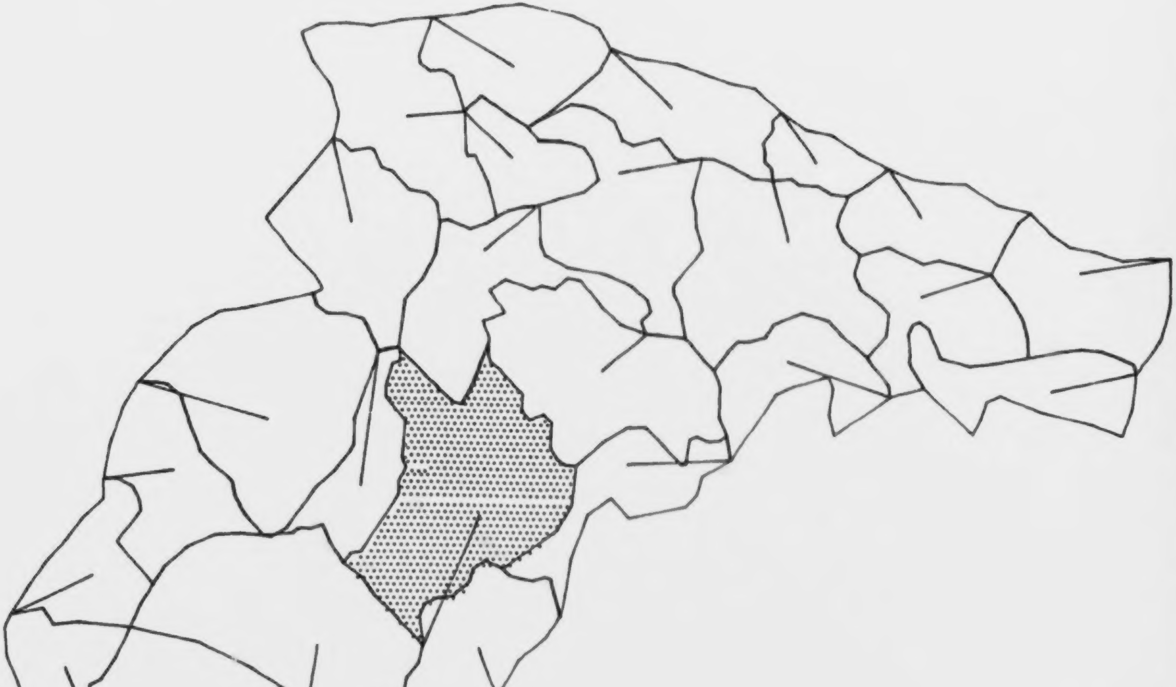
Showing administrative subdivision boundaries.

Figure A3.2



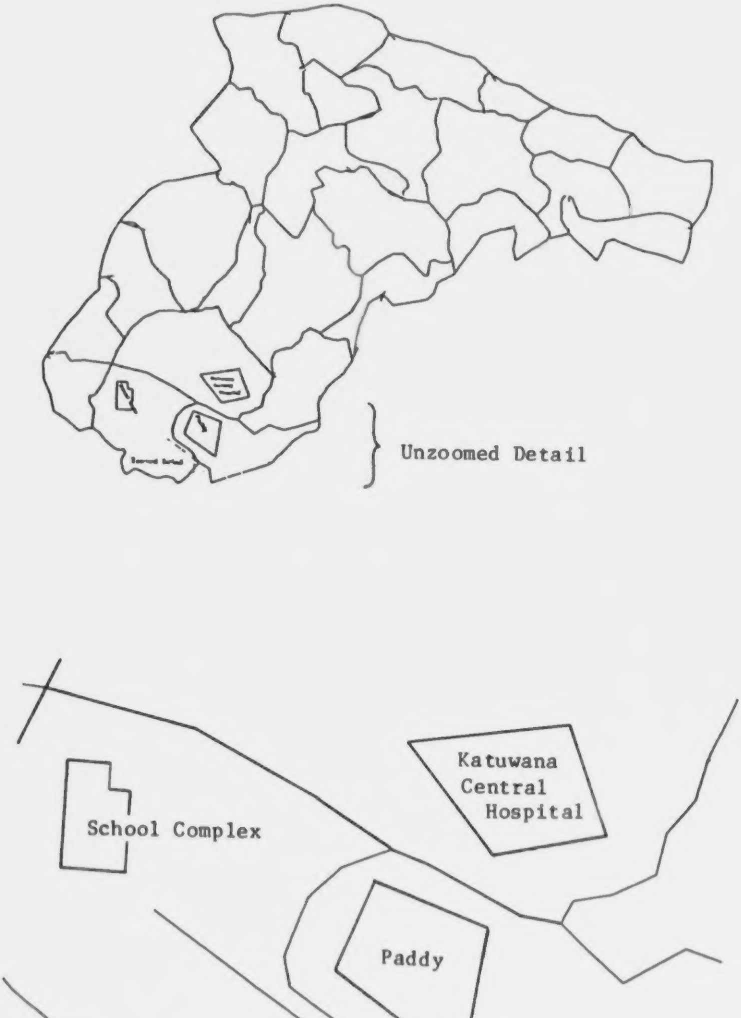
Lake imposed on the administrative boundaries.

Figure A3.3 Concept of Hatching



Varying Information Needs for Local and Regional Planning

Figure A3.4 Concept of Zooming


Unzoomed Detail
Katuwana
Central
Hospital
School Complex
Paddy
Zoomed Detail

APPENDIX 4. MICROCOMPUTER-BASED EVALUATION AND PLANNING TOOLS FOR RURAL CENTRE DEVELOPMENT IN THIRD WORLD COUNTRIES

By H. Detlef Kammeier and Barjor E. Mehta

The main concern of this package is to provide visual descriptions of the spatial implications of services and utilities through two tools: The Central-Place Scalogram, and the Accessibility/Centrality Index. Both tools aim to permit the planners in the field to analyse the existing spatial situation under alternative assessment parameters and to appraise various planning options, given a limited set of data. The focus is on the complex relationships of rural service centres and their hinterlands.

The Central-Place Scalogram calculates the settlement centrality based on the Guttmann scaling technique. The software for this has three modules: The first stores the regional data and consists of information on the availability of services in each settlement; the second does the data sorting and calculating functions; and the third presents the results.

The Accessibility/Centrality Index attempts to measure the access that a settlement has to a specified list of services, given a road network, existing transport facilities, and a modifiable set of criteria to determine acceptable time-distances. Centrality is measured on the basis of the number of services accessible within a given range of time-distances. The information that this technique uses is point data (data relating to settlements taken as points), line data (data relating to links between settlements), and evaluation criteria for the services in the region. Here, too, the software contains three modules: Modules for inventory and/or plan formulation, data analysis, and simulation of planning decisions.

Accessibility/Centrality programmes allow the spatial effects of alternative resource allocations to be fully visualized, permitting an iterative optimization to be adapted to the existing situation.

These two packages were applied to primary data collected from Jambusar Block of Gujarat State in India.

A summary of this paper is published in Computer Environment Urban Systems 10 (2:1985).

APPENDIX 5. MICROCOMPUTER-BASED ASSESSMENT OF THE ACCESSIBILITY OF CENTRAL PLACE SERVICES

By H. Detlef Kammeier

Rural centres, small- and medium-sized market, towns, and district centres have gained increased attention in efforts to strengthen rural development and reverse polarization. Simple but reliable planning tools are needed to evaluate the existing potentials and constraints, as well as to visualize the effects of alternative planning decisions. Something more than the scalogram is required to analyse the centre-hinterland relationships. Questions of accessibility to all kinds of central services and facilities are crucial.

In the software package developed, the computation of scores in relation to time ranges is a core component. It is also possible to formulate weight indexes for groups of services, or a total composite index of accessibility/centrality. Because the software is extremely user-friendly, even a person with a very elementary knowledge of microcomputers can use it. It consists of four modules: The first is an inventory of user supplied data; the second and the third compute single-service indexes and weighted composite indexes, and its graphics component can produce either isopleth maps or filter maps; and the fourth module can give an economic assessment of proposed alternatives. The computing modules can print summary tables to show how many settlements and which parts of the population are within certain percentage ranges of the index, which enables us to determine the number of settlements and/or population below or above given (critical) levels of the index.

The composite index can be printed as an absolute or relative score, which enables us to compare alternative planning scenarios; the baseline situation can be compared with expected results from alternative development proposals, such as road improvements or additional services at various locations. The fourth module which still has not been field-tested, attempts to answer questions on cost-effectiveness and others of a similar nature.

Much of this package has been applied in a service centre planning exercise in Sumatra, Indonesia, but it needs to be tested under varying conditions elsewhere.

A summary of this paper is published in The Asian Geographer (September 1986).

COMMENT

Frank le Clercq

The paper raises the interesting question about the varying needs for information at the various levels of planning. The point is clear and well illustrated, but not so well discussed is the suggested remedy in terms of information requirements and training.

Requirements for information are addressed in Appendices 1 and 2. The main text only refers to these appendices by saying that they do not differentiate the levels of planning. It would have been useful if the author had combined both appendices into one, dealing with levels of planning and elaborated his discussion in the main text.

The part about training roughly differentiates simple and more complex data to be gathered and to be dealt with by less and already more educated personnel, respectively. With respect to information, both categories seem to need training, but the author is not quite clear about it because the paper then focuses on training that deals with the interaction between planning needs and information. For this latter purpose, Appendix 3 is introduced, which intends to exemplify the need for training programmes. Appendix 3 partly does this, but would be much more informative if a programme curriculum was included instead of a substantive description of the use of the programme Autocad and SPSS in a specific project.

COMMENT

Jinichiro Yabuta

This paper clearly describes the importance of identifying and collecting information necessary for local and regional planning. As the paper demonstrates in the example of food distribution and production planning, different information are crucial to planning at different levels. This is very natural since national decision makers are interested more in national issues than in local-specific ones, while local decision makers, including the people, are interested in local issues. It should, however, be noted that local decision makers have to know not only the local but also the national or even international situation insofar as the situation has much to do with local-specific issues that need to be taken into account in local planning. Whether a macrolevel top-down or a microlevel bottom-up approach is taken, a multilevel information system is needed in planning. My comment highlights the need for a bottom-up approach to the multilevel information system.

First, the information system built on a top-down approach often does not meet the information requirement of a certain area. For example, a series of thick national statistics provide information on the area of plantation by crop, size of holdings, and so forth, and rubber export by such things as quality and port. But these data are hardly useful in planning an area in need of rubber replanting and, thus, require information on the number of rubber trees planted in a certain area and time of planting.

Second, even under a seemingly stagnant economy, changes in the local socioeconomy often take longer than it takes to build a nationwide information system. For example, the national agricultural statistics of a country provide no information on oil palm, as it is too new for the central government administration to deal with systematically. However, it is unrealistic to plan without looking into the factors about oil palm that are drastically changing the patterns of land use, land holding, and settlement in a particular part of a country.

A great effort is, therefore, necessary to prepare area-specific information in a timely manner, even at the cost of statistical accuracy and interregional consistency. Who can efficiently prepare such information? The local people and officials can. As this paper stresses, training is necessary to enable them to translate their felt needs into an action proposal, and to identify the information necessary to concretize and justify such a proposal.

Comment

The effectiveness of microcomputers themselves in the "interaction of technical and socioeconomic variables at the local level" must be more limited than this paper suggests. They are surely useful in building up a base for cross-areal statistical analysis, especially in countries which suffer from the shortage of people capable of keeping and handling various statistical records in a proper manner. In this connexion, attention should be given to the standardization of filing, processing, and presentation at different areas and levels with respect to selected common variables rather than to the interaction of different variables at the local level.

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AN INTEGRATED APPROACH TO TRAINING FOR THE ESTABLISHMENT AND USE OF INFORMATION SYSTEMS FOR SUBNATIONAL DEVELOPMENT PLANNING

K. V. Sundaram

THE CHANGING SCENARIO OF DEVELOPMENT IN THE DEVELOPING COUNTRIES

The last two decades have seen some important changes in the field of development planning. So far as the developing countries are concerned, these changes may be perceived in three major directions, viz.: (a) changes in the orientation of planning from the emphasis on public sector investments to measures contributing to a direct attack on poverty and an improvement in the quality of life; (b) changes in the structure of planning from a centralized approach to a more decentralized approach directed towards improved subnational development planning; and (c) an enormous need for disaggregated data and information for planning purposes.

The changes in the orientation and structure of development planning is diagrammatically illustrated in figure 1.1/ With the changes that have come about, not merely the need for data and information at disaggregated levels has grown, but also the need for some extremely specialized and specific information in relation to the development strategy adopted has become imperative and urgent. While the information provision activity in the developing countries is yet to respond fully to the varying perceptions of development planning and the different strategies introduced from time to time,2/ there is no doubt that a lot of fresh data and information are now being generated in the developing countries through resource and socioeconomic surveys. Further, the application of sophisticated techniques like remote sensing, has also helped to update natural resource inventories. With these developments, the increases in the variety and volume of territorial data (topographic, administrative, environmental, demographic, socioeconomic, and other data) being generated today in any country have become quite appreciable. Simultaneously, tremendous development leaps have taken place in the field of information technology based on the multiple application of microtechnology and optical electronics, which have placed at our disposal tools that can quickly collect, store, process, and transfer data and information of all kinds. Many experts in the developing world now feel that what we are dealing with here is nothing less than a powerful "technological avalanche," which is unstoppable because of its innate dynamism and also because of the economic conditions of today's international marketplace. Juan Rada, a Chilean expert in communications technology, when analysing the problems of computer technology as it affects the developing world, has concluded as follows:

An Integrated Approach to Training

Information technology is a reality, and a rapidly expanding one. The question, therefore, is how to master the changes and deal with these issues to the best advantage for development strategies. What is needed is a socioeconomic command of the development of science and technology.3/

Figure 1. Schematic Diagram of Structure and Orientation of Development Planning

	Development Strategy of Public Sector Investments	GDP Growth with		GDP & Welfare Objectives Through	
		Trickle Down Effects	Redistribution through Balanced Regional Development	Fiscal Policies and Transfers to Low-Income Groups	Target Group Participation & Entitlement Programmes
	ORIENTATION				
STRUCTURE					
Central Planning					
Deconcentration					
Decentralization					
Local Self-Reliance					

The crucial question, therefore, seems to be: How to acquire socioeconomic command of the developments in the field of information technology. The only way that this problem can be tackled in the developing countries is by mounting a large-scale training and retraining of manpower for the relevant target groups -- a task that needs to proceed with the utmost speed and in greater depth than it has up to the present.

THE NEED FOR AN INTEGRATED APPROACH

The new information technology is bound to influence planning in many ways:

(a) More data and information will become available;

(b) more quantitative analytical procedures will be technically possible;

(c) most mapping and graphics will be computer produced; and

(d) greater use of cost models and other performance models will be possible.

In order to take advantage of the new possibilities and their potential, it would be necessary for any country adopting the new information technology to establish the following prerequisites:

(a) Reliable collection of data at the sources and a knowledge of how to feed these into the system;

(b) a viable communications network;

(c) a sound personnel base with experts conversant not only with the technical side of their equipment but also with the methods of handling the vast volume of statistical material; and

(d) knowledgeable experts in government (i.e., in the ministries of finance and planning), who are able to evaluate the material so as to make decisions which help the development of the country.

Contemporary debates on information technology are dominated by design issues. They are led more by technology rather than by human resources or organizations. The latter emphasis is important for the effective absorption of technological progress and for building up indigenous capabilities, which can purposefully and profitably utilize the information technology and all the new possibilities that it affords. The use of information technology cannot be contented with a "stand alone" applications approach. Blind pursuit of technical objectives will fail to generate the expected high performance standards and net benefit levels.

In order to derive the best advantage, the use of information technology has to take note of the requirements of different groups in the real world situation. These groups will include data generators, policymakers or top-level administrators, planners, development analysts, and system designers. In the current preoccupation with system designing, the other players in the game have been neglected. Technology seems to have run ahead of the dream of decision support. The systems developed have not been able to do the jobs needed and a "mismatch" has grown.

The task today seems to be to arrest the shift of the pendulum and to restore some balance in the approach. In a multilevel planning system, the task will be to enrich the capacity of the information technology so that the multitude of transactions occurring at a number of discrete points or area levels where policymakers, planners, development analysts, and system designers may interface, would be rendered purposeful, meaningful, and mutually beneficial. This demands an integrated approach to training so that technical success in information technology is matched with the ability to use the system for improved subnational planning and for providing effective feedback for innovative designing of systems. The integrated approach to training here is meant to impart relevant knowledge, skills, and attitudes to both designers and users so that they become partners in a shared exploration of a system's capabilities. It should be noted that this implies both "machine training" (i.e., teaching individuals the use of a specific piece of kit and software) as well as "machine education" (i.e., providing the necessary orientation about the capability of the information technology) so that the best use could be made of the products of the system.4/

THE STATE OF THE ART AND PLANNING NEEDS IN THE ASIAN AND PACIFIC REGION IN REGARD TO INFORMATION TECHNOLOGIES

Before we go into the substantive issues of training, we may take a quick overview of the contemporary developments in subnational development planning in the countries of the Asian and Pacific region, the data and information needs for meeting their planning requirements, and the state of the art in information technology. Our source of material for this assessment is the International Seminar on Information Systems for Subnational Development Planning organized by UNESCO in Visakhapatnam, India, 16-20 December 1985.

The review undertaken in this context revealed that most of the countries in the region have been grappling with the problem of the decentralization of development administration since they became independent from colonial rule, and they are making various efforts to link planning and management functions at the regional and local levels to self-government institutions. More recently during the 1970s and early 1980s, they have been making more serious efforts towards decentralizing development planning and management functions to the subnational areas in their countries.5/ These efforts have taken diverse forms, reflecting various political systems, administrative structures, and developmental policies.

Recent developments in these countries show that the national governments are seeking to push the relevant planning and decision making tasks to some chosen subnational levels in their hierarchical setup and to endow these levels with corresponding authority and responsibility. One of these important responsibilities relates to the generation, processing, and flow of information back and forth along a network of communication linkages to direct the country's socioeconomic development. The state of the art of the decentralization process in this direction in many of the countries shows that the "authority structures" (i.e., the decentralization of planning and decision making functions and delegation of power and control functions) have not matched with "information structures" (i.e., the design and implementation of data and information networks).

In regard to changes in the orientation of development planning, the major thrust in all these countries has been on implementing certain decentralized development programmes aimed at the alleviation of rural poverty. These programmes have necessitated the building up of strong data bases touching on poverty, unemployment, and standard of living at the disaggregated level of the rural household. The inadequacy of the data bases on these aspects has been noted as a serious deficiency hampering a quantitative assessment and analysis of the dynamics of change in the situation regarding poverty.6/ Further, the magnitude of data to be handled for these programmes and for building profiles of the poor in terms of income or expenditure, measures of the quality of life (e.g., literacy and infant mortality rates), indicators of working conditions (e.g., wage rates), and the like is astounding.7/

Manual handling of such data has given rise to a lot of problems in implementation. In some countries, like India, the sheer magnitude of the data handling problem is compelling the government to go in for computerization.

However, the absence of certain prerequisites are hampering such developments. These include: (a) lack of an adequate number of trained personnel who can manage and operate the system; (b) lack of a reliable power supply to operate the computers; (c) absence of a properly functioning telephone network to transmit data; (d) lack of adequate capital to purchase the new technology at a time when hardware is decreasing in price, but software is becoming more expensive and not adapted to the needs of the developing countries; and (e) lack of qualified programmers who can redesign the software or write new programmes.8/

As for the development of information technology, the progress in the developing countries is quite uneven. But there are also some significant breakthroughs in a few countries. China has developed a Resources and Environment Information System (REIS) with expensive application of computer and remote sensing technology since 1980.9/ As a result of the great importance that has been attached to the research and applications of REIS by different departments, institutions, and specialists in China, REIS has made substantial progress in a short time in many aspects, such as theoretical applications, the formulation of standards and norms, laboratory experiment, system development, and practical applications. Its application in economic construction, regional planning, environmental protection, and the designing of engineering projects has yielded certain economic and social benefits.

India is evolving a Natural Resources Data Management System (NRDMS) in which thirteen advanced technical institutions in the country are collaborating.10/ The goals of the NRDMS are:

(a) To make an assessment of natural resources (e.g., land, water, atmospheric environment, and human resources) of the areas under study;

(b) to utilize the information for the purpose of planning and development at various levels; and

(c) to establish a computerized monitoring system for evaluation of development projects and programmes during the execution phase.

For district planning, five pilot projects have been chosen in different parts of the country, and an integrated composite software package for district planning (called "GRIDS") has been developed by one of the participating institutions, the Institute of Coastal and Off-Shore Research (INCOR), and is being pilot tested. The concurrent monitoring being attempted for the Integrated Rural Development Programme has been completely computerized. Training programmes are also being organized for different categories of target groups. The first such programme for middle-level personnel (technicians and planners) was conducted in May 1986.

A second direction in which some developments have taken place in India is in regard to the development of information systems for urban and regional planning.11/ Currently, the task of identifying the data needs and suggesting ways and means for developing and implementing two systems are under way, viz., the Urban Information System (URBIS) and the Regional Information System (RIS). Pilot studies in two towns have been undertaken to test the relevance of URBIS.

A third major development in India is the implementation of a Computerized Rural Information Systems Project (CRISP) at the district level being developed by the National Informatics Centre (NIC) which is the nodal agency for implementation. Initially the project is being implemented on a pilot basis in ten selected districts in the country. By 1989, it is proposed to cover 150 districts, i.e., one-third of the country. The software technology proposed for the programme will enable the processing and monitoring of complete information in regard to two sets of programmes operating in the rural areas, viz., area programmes and beneficiary programmes. CRISP is being developed and implemented to ensure its integration into the district-level computer network, which is to be set up by NIC in the future.

In Thailand, development plans and information systems are mostly manual.12/ The only exceptions are the existence of subnational information systems for the Eastern Sea Board (ESB) development implemented during 1982-83 and the development of the Highland implemented during 1984-85.

Nepal does not have any organized systematic information system.13/ Piecemeal approaches to information generation and dissemination are designed by some sectors independently to serve their own specific needs and purposes. It has been keenly felt that the Integrated Rural Development (IRD) Programme needs a reliable and valid data base for effective planning and management of IRD. There is also a lack of interagency coordination in data collection activities.

The only computerized information system in Sri Lanka operating in the state sector at the subnational level is that developed for the Kalutara district with the collaboration of United Nations Economic and Social Commission for Asia and the Pacific (ESCAP).14/ The pilot project is designed to process such data at the district and subdistrict (divisional) levels to meet the requirements of local planners and administrators. The project also attempts to design a geocoded information system to present data on a spatial basis.

In Indonesia, a regional data base for physical planning is being developed in the Ministry of Public Works.15/ The National Coordinating Body for Survey and Mapping (BAKOSURTANAL) installed the COMARC computer-assisted cartographic system in 1979 to meet users' expanding demands for topographic information. The geographical information system or regional data base has been installed in the Data Processing and Mapping Centre (PUSDATA) of the Ministry of Public Works. In the near future, Indonesia will be strengthening and upgrading institutional capability for the purpose of developing a data and information system on land resources at the national and provincial levels and for the physical planning process. A project was established in October 1984 with technical aid from the Asian Development Bank.

Bangladesh, Vietnam, or other countries of the region not mentioned above have not reported any computerized information systems.

From this account, it may be seen that the applications of information technology in most countries in the Asian and Pacific region is in very formative stages of development. Even in some of those countries which have reported the existence of some computerized information systems (e.g., Sri Lanka, Thailand, or Indonesia), these developments have been due to external support. It is apparent that for most third world countries, it is extremely difficult to develop and promote information technologies on their own. Some threshold countries, such as China or India, have developed a few technology enclaves, but they are yet to develop the technology on a countrywide scale. For many other countries, the start-up conditions seem to be simply too unfavourable.

It is in this context that a search for feasible solutions and compromises is necessary, and a "blending" of old and new technologies is recommended. Such a blending strategy would be advantageous, because the information technology in this case will not replace, but supplement, existing technologies. Whether a country uses high technology or appropriate technology, the training needs are bound to be the same, as even the latter approach implies preparation for a continuous and rapid transition. Indeed, it would be truer to say that the training needs for these countries are infinitely greater and more urgent, as time is running out and the third world is being steam rollered by technological progress.

Thus, a graduated approach for the dissemination of information technology is recommended for the developing countries. This approach should take note of the various constraints and provide for the following:

(a) Smooth transition from existing to new technology;

(b) optimum utilization of existing equipment and skill;

(c) possibilities of upgrading equipment in case of growing demand;

(d) wide diversity of outputs to meet all types of needs; and

(e) possibility of step-by-step progress in establishing equipment to allow for staggered investments and training.

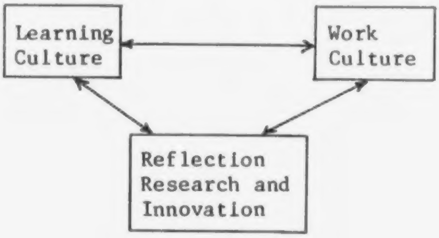
The training programmes should also be designed by taking note of the above approach.

THE TARGET GROUPS AND THE APPROACH TO TRAINING

We may now outline our ideas for an "integrated approach" to training for the developing countries in the field of information systems. Our discussion in the second section of this paper, has revealed that any training programme intended to realize the full potentials of information technology must encompass a large category of target groups consisting of people who will be managing and controlling the information technology (the designers), those engaged in data collection, processing, and feeding into the system (survey and data collection specialists -- or SDCS), and those who will be using the output of the system (the users). In the user category, we may distinguish two subgroups, viz., policy planners and decision makers, and planners and development analysts.

Our strategy for training in information technology should be based on the principle of encouraging mutual analytical interaction among the three target groups identified above for promoting further learning, research, and innovation. For this purpose, the nature of interaction and output achievement envisaged could be as shown in figure 2.

Figure 2. Mutual Interaction Strategy



In this conception, each target group would be at once the agent of knowledge individually and also the beneficiary of learning collectively, while working together during the training period. The interaction between them would provide scope for reflection on what they are doing, so that further learning and innovation can take place. In this way, the formal training programme can become a strategy for carrying out innovative adaptations in information technology. This would mean that more dialogue should be encouraged between the development experts and the technical experts, so that the former will be able to know the potentials and capabilities of a particular information system, and the latter will be enabled to understand the intentions (i.e., the objectives) and the data and information needs, as well as the processing and analytical needs, of the planner. In this way, the development experts would be encouraged to use sophisticated analytical tools including statistical analysis of data and preparation of models using simulation and other techniques. The technical experts, on the other hand, will get feedback about users' needs and thus will be enabled to innovate and develop various software applications suited to different planning requirements. Thus, better linkages will emerge between data management endeavours and the decision making processes that make use of the data. It is to be noted that it is the formation of these linkages that will make the greatest difference. We would, therefore, emphasize that unless an integrated approach to training in this manner is adopted, the overall implementation of information systems would seem destined to fumble in the dark.

FOCUS AND CONTENT OF THE TRAINING PROGRAMME FOR THE DIFFERENT TARGET GROUPS

In order to attain the expected high performance standards and net benefit levels, the information technology strategy adopted for any country must be attuned to the users' needs and take into account the multilevel planning structures, cultural structures, and administrative organization, as well as political and economic realities. It must capture the goal concepts related to planning at various levels in a country and must recognize the distinct data and information requirements of the different phases of the planning process.16/ It must also take note of the various steps of information processing necessary for planning and the major analytical techniques that will be used in the planning process in the country.

Accordingly, any training programme designed for the different target groups must include within its curriculum the following key knowledge dimensions:

(a) Education about the multilevel planning process in the country; goals for specific area levels of planning, and relevant national and regional policies in the country.

(b) Data and information needs for different levels and different phases of planning.

(c) Planning procedures and information processing steps relevant to the planning process operating in the country at various levels.

(d) Planning techniques relevant to the planning process, e.g., basic techniques for data collection and analysis, techniques for project and programme appraisal and feasibility analysis, econometric modeling and forecasting techniques, and techniques for monitoring and evaluation.

(e) "Computer education" to educate particularly users to think about the ways to use the information that the technology can provide and to sensitize them on the system's capabilities, hardware and software developments, and graphic information system.

(f) "Computer training" to train those who would operate and maintain the information system for particular jobs with dedicated applications, i.e., imparting to them special competence in some important skill areas including designing and development of software.

The above six dimensions of knowledge, in the very basic outline form indicated here, may be deemed to constitute the core curriculum for a training programme on information technology. However, the training programme for the different target groups that we have identified (i.e., the designers, the SDCS, and the users) cannot be patterned mechanically on the same lines. Their different requirements have to be kept in view. Accordingly, the proportions of the mix of knowledge and skills to be imparted will differ for the different target groups. Thus, the information kit of (a) to (d) above may be deemed generally common to all the target groups, though the intensity and detail of treatment may vary. The programme intended for the designers would lay emphasis on the information kit set out in (f). The programme for the SDCS would lay emphasis on the information kit outlined in (c) and (d). The programme for the users, again, will vary in detail and depth depending on the composition of the target group. The policy planners and decision makers will mainly receive awareness education about the possibilities and potentials of information technology, and orientation related to managerial issues. The second user category of planners and development analysts, on the other hand, will receive more detailed training on the use of the system for sophisticated planning exercises.

As for the organization of the training programme, our emphasis is on an "interactive method," in which all the target groups will be brought together for the maximization of net benefits. While some aspects of the training programme will be common to all, they may branch out for particular orientations after going through a common curriculum initially. This would be an ideal method. The more the training programmes are patterned on this model to draw different target groups together and encourage active interaction among them, the better it would be for the end result of training.

We may also draw a distinction on training methods suited to different target groups. The following mix is illustrative:

(a)	Designers:	Lectures; case studies; exercises and demonstrations; interaction with user groups.
(b)	Survey and Data Collection Specialists:	Lectures; exposure to computers and microprocessors; demonstrations of limited applications; interaction with designers and data collection agencies.
(c)	Users:	
	(1) Policy Planners and Decision Makers	Through intervention in ongoing programmes, conferences, symposia, or seminars (purposeful intervention through the gatecrash method); sensitization through demonstration and display techniques (poster sessions); exchange of experiences in open seminar discussions; interaction with designers and producers of hardware components.
	(2) Planners and Analysts	Workshop method; case studies; exercises and demonstrations; limited lecture sessions; interaction with designers.

PREPARATION OF TRAINING PACKAGES OR MODULES

A major challenge for training is the preparation of training materials. This is a task in which both national and international agencies should collaborate. Taking into account the desirable orientations or thrusts to be imparted to the training of different target groups, a set of training packages or modules may be outlined. Broadly these could be as is shown in table 1. Each module will consist of two major parts, viz. (a) the theoretical framework, and (b) the illustrations, case studies, background notes, and reading references. It will also consist of written material and teaching aids such as slides and audiocasettes.

PROSPECTS AND PRIORITIES FOR FUTURE ACTION

The present trends towards subnational development planning in the developing world indicate that notwithstanding the limited accomplishments in the field of information technology at present and the inadequacy of the national infrastructure systems in many countries of the region, the prospects are that the new technology will not remain alien to them for long. This optimism is induced by the fact that in the wake of the decentralized planning efforts that are under way in these countries, the need for data and information and their handling and processing to meet the planning requirements have grown tremendously, and there is keen interest among the countries to switch over to the new technology as early as possible. These trends were clearly brought out in the discussions that took place in Visakhapatnam in December 1985. How quickly the new technology will be absorbed in these countries will depend on the speed with which the prerequisites for its introduction are met. This underlines the need for massive training programmes in this direction in each country. In this context, concerted action is necessary both within particular countries and at the international level in the field of training and supportive activities.

The priority task of the countries in the region is to increase national training activities. They should make efforts to improve and expand their training activities. The setting up of specialized training centres solely for imparting training in information technology is unnecessary, as it would be both a costly and lengthy affair. Perhaps the approach could be for this training activity to find its way into existing training centres in such related fields as national planning and sectoral management, public administration, urban planning, and social development. The national focal points for training must be identified, and they should be formed into a network so as to facilitate exchange among them of information on applications and dissemination of training material.

International bodies can render invaluable assistance to the developing countries in this regard. This assistance can be in a number of areas such as the design and preparation of training courses, provision and exchange of experts for teaching, exchange of training material and new software developments, training of trainers, organizing promotional courses for specific countries which need such intervention, and post-training evaluation of results. International agencies can also provide catalytic assistance to establish and promote the training network in each country. They can especially provide appropriate networking tools to foster communication between users, such as the establishment of information dissemination centres (IDCs), newsletters, and arrangement of periodical seminars and workshops.

TABLE 1. TRAINING PACKAGES OR MODULES

MODULES		TARGET GROUPS			
		Designers	Survey & Data Collection Specialists	User (a)	User (b)
1.	Multilevel planning: goal concepts and the planning process	X	X	X	X
2.	Data and information needs for subnational development planning (in a multilevel planning framework)	X	X	X	X
3.	Organization and flow of data for local and regional planning and its integration with the national system of statistics	X	X	X	X
4.	Processing of data (for different levels of subnational development planning and its presentation)	X	X		X
5.	Information technology, hardware, and software aspects: thematic mapping package for display of spatial data - elementary		X	X	X
6.	____________ d° ________________ - advanced	X			
7.	System design aspects	X			
8.	Management information system for planning (a) data for plan formulation (b) implementation and monitoring (c) evaluation/performance appraisal	X	X		

THE EFFORTS OF UNESCO AND PROPOSALS FOR THE FUTURE

Among the specialized agencies of the United Nations system, the United Nations Educational, Scientific and Cultural Organization (UNESCO) occupies a unique position in that it has specific and sizable programmes devoted to information *per se*, ranging from libraries and archives to information and data systems. In 1976, the General Information Programme (PGI) was established to provide a focus for UNESCO's activities in the area of scientific and technological information, documentation, libraries, and archives management. This programme incorporated the UNISIST programme which was created in the late 1960s and produced a set of methods, norms, standards, and guidelines designed to help in the creation of compatible information systems and services and their interconnexion in order to facilitate information exchange throughout the world. An intergovernmental council consisting of representatives of thirty member states determines the policies and programmes of PGI. The UNISIST II Intergovernmental Conference of 1979 recommended the extension of the programme to cover information and data for development so as to meet the needs of development planners, policymakers, and administrators at one end of the user spectrum, and at the other end, those of people at the grass roots level.

UNESCO's activities in the information area are essentially designed to enhance the capacity of member states to handle, transfer, and share information and information resources and the effective utilization of information and data in development activities. Such information and data may be either generated within the country or flowing in from abroad or else accessed there. UNESCO's action involving assisting member states in formulating national information policies, developing libraries, archives, or information system infrastructures, training information personnel, and making users increasingly aware of the value of information *per se*. Such assistance may take the form of support for consultant missions; the provision of norms, standards, and guidelines for information handling and systems interconnexion; the organization of seminars and conferences; or support for training courses, workshops, and demonstrations of information systems and their use. The PGI/UNISIST programme has provided a framework within which member states and international organizations can collaborate by sharing resources, developing compatible international information systems designed to be linked to a flexible global network for the exchange of information, and taking part in programme activities.

During the first phase of the implementation of the programme, UNESCO's activities concentrated on the formulation of information policies, norms, and standards for information handling and systems interconnexion and on the provision of assistance for the development of infrastructures and information manpower. In its Second Medium-Term Plan, 1984-89, following up on the recommendations of expert consultations and the suggestions of member states, PGI/UNISIST has placed emphasis on: (a) users' needs, (b) operational activities, (c) regional cooperation, and (d) the introduction of modern information technology in the developing countries. This shift in emphasis will also facilitate the move towards establishing a global cooperative information network.

Among UNESCO's recent activities in the field of information and data for subnational development planning, the following may be specially mentioned:

An Integrated Approach to Training

(a) UNESCO/PGI supported a programme in collaboration with the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands, which brought together development planners and information specialists from developing and developed countries in a series of seminars enabling exchange of ideas and experiences in development planning and information support systems. The papers and proceedings of the meetings have been published.17/

(b) As a practical follow-up of the above activities, UNESCO organized an Asia-Pacific Regional Seminar on Information for Subnational Development Planning, at Visakhapatnam, India, in December 1985. The Visakhapatnam Declaration called on the governments of the region to develop a national information policy and to establish, with international assistance, an Asia-Pacific Regional Cooperation Programme on Subnational Development Planning with one or more nodal organizations in selected countries in the region to coördinate developments and exchange experiences with national contact points. This would particularly help in manpower development for data and information support systems for subnational development planning.

Following the Visakhapatnam call, UNESCO has received a proposal for the setting up of a nodal organization at the Institute for Coastal and Offshore Research (INCOR) in Visakhapatnam, India. Another initiative in the region which might contribute to the proposed programme includes a joint project for international cooperation in teaching and research in rural and regional development planning at the Asian Institute of Technology, Bangkok, in collaboration with the Institute of Social Studies, The Hague.

If two centres could be established with one concentrating on the South Asian region and the other on the Southeast Asian region, it would make possible the provision of useful inputs for, and coordination of, regional efforts to improve information systems for subnational planning and the training of personnel in the developing countries of the region. If the United Nations Centre for Regional Development were to complement these efforts by initiatives to establish a centre to cater to the needs of the East Asian region, it would complete a network in the Asian region.

(c) With a view to advising member states on the initial planning and further expansion of training programmes and to teach in special subject fields, UNESCO provides expert services to the countries upon request. For example, in the field of data for development, support has been provided to an ESCAP/UNESCO project aiming at the use of microcomputer technology at the district and divisional levels of administration in Sri Lanka. In such operational projects, training is invariably built in as a component. Similarly, UNESCO has supported various consultancy missions specifically in the field of training in the information area.

(d) As part of its regular activities of promotion of international and regional training, UNESCO sponsors ten to fifteen international or regional courses and seminars every year on various subjects and at different levels, giving priority to courses for teachers and managers of information systems and services. It is expected that some of these will be devoted to data for development in the coming years.

(e) As a preparatory effort in this context, special reference should be made to the support given by UNESCO for the preparation by the Data for Development International Association of teaching aids on the establishment, coordination, access to, and utilization of socioeconomic and administrative information systems. The training kit or package that is being developed contains eight modules covering existing types and structure of information systems and their utilization; theoretical and technical aspects of information systems, strategy, and management as well as the modalities of access to information systems; graphical, cartographic, and statistical tools; geocoding theory and application; and recent developments including cartographic information on microcomputers and remote sensing. Information for local planning needs is given particular emphasis. The training package is expected to be available for wide distribution and testing by the end of 1986 in English and French. It is hoped that this package will meet many of the requirements outlined in table 1 of this article, particularly modules 5 to 8. Perhaps, modules 1 to 4 will require further elaboration in the finalization of this project.

(f) As a follow-up of the recommendations of the Visakhapatnam seminar, UNESCO hopes to promote the establishment of a software demonstration and training centre for subnational planning information system application which could serve the Asian and Pacific region. An inventory of software packages is planned and activities in other regions may be developed in the future. Cooperation may be developed in this context with the Spatially-Oriented Referencing Systems Association (SORSA).

Thanks to the efforts of various international organizations like UNESCO, HABITAT, ESCAP, FAO, and UNCRD, the governments in the developing countries are now being assisted to deal with the problems and opportunities presented by information systems for subnational development planning. The need is to coordinate the various efforts and to encourage the networking of the various governmental, training, and research institutions engaged in the field of information system for development planning in the different countries of the region. Training of both information specialists and users, whether formal in nature or simply informal exchanges of experience, represents a key factor in such cooperation. The efforts of UNESCO summarized in the above paragraph are particularly significant in this context. In this way, the developing countries would be able to benefit from existing experiences in information systems for development planning and to learn more about the complex relationship between information and planning through cooperative studies, projects, and seminars.

NOTES

* This paper has been prepared for UNESCO under contract.

1/ Food and Agriculture Organization of the United Nations (FAO), "Toward Improved Multilevel Planning for Agricultural and Rural Development in Asia and the Pacific" (FAO Economic and Social Development; paper 52) (Rome: FAO, 1985).

2/ K. V. Sundaram, "Data and Information Needs for Subnational Planning" [Keynote paper presented at the UNESCO Seminar on Information Systems for Subnational Development Planning, Visakhapatnam, India, 16-20 December 1985].

3/ Juan Rada, "The Microelectronics Revolution: Implications for the Third World," Development Dialogue 2(1982): 41-67.

4/ From the standpoint of training, this distinction between "machine training" and "machine education" is quite significant. For a definition of these terms and their implications for an organization's successful use of information technology, see: S. Barrett and S. Baddeley, "Information Needs for Local Authorities: Small is Beautiful" [Paper contributed to Joint UDM-SORSA Symposium on Information Needs for Local Authorities, The Hague, 2-6 June 1985].

5/ For a good documentation of these changes see FAO "Toward Improved Multilevel Planning for Agricultural and Rural Development in Asia and the Pacific."

6/ See Rizwanul Islam, ed., "Strategies for Alleviating Poverty in Rural Asia" (Bangkok: ILO-ARTEP, 1985).

7/ For one district in Karnataka State in India, beneficiary profiles had to be built up for the following number of persons against various poverty alleviation programmes:
(a) Integrated Rural Development Programme - 3,000 persons
(b) Negilubhagya Scheme - 2,500 persons
(c) Gobar gas scheme - 1,200 "
(d) Antyodaya programme - 2,000 "
(e) Wells scheme - 1,656 "
See Sanjoy Das Gupta, "District Level Computerization: The Karwar Experiment" [Paper presented at the UNESCO Seminar on Information Systems for Subnational Development Planning, Visakhapatnam, India, 16-20 December 1985].

8/ Inga Krugmann-Randolf, "High Technology: What Chance for Developing Countries?" Development and Cooperation 3 (June/July 1985).

9/ He Jianbang and Yang Kai, "Research and Progress in the Resources and Environment Information System in Some Chinese Institutions: A General Survey" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

10/ R. V. Rama Rao and P. C. Raju, "Natural Resource Data Management System for Planning" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

11/ P. K. S. Nair, "URIS in India: Information Needs" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

12/ Krisorn Jettorntrum, "Subnational Information Systems: Thailand, A Brief Note" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

13/ Shyam S. Khadka and Padma Shrestha, "Information System for Planning Integrated Rural Development Programme, Nepal" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

14/ H. A. Abhayagunawardhana, "Use of Microcomputers at the District Level: The Kalutara Pilot Project" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

15/ Suroso Moersidi, "Regional Data Base for Physical Planning" [Paper presented at the UNESCO Seminar, Visakhapatnam, 16-20 December 1985].

16/ The Visakhapatnam seminar contributed to a clarification of the goal concepts for a multilevel planning structure and the related information needs. See Sundaram, "Data and Information Needs for Subnational Planning."

17/ W. H. De Man and A. D. J. Schaap, eds., Proceedings of the Workshop [on] Information Requirements for Development Planning in Developing Countries (Enschede: International Institute for Aerial Survey and Earth Sciences, 1980). This has been followed by W. H. De Man, Conceptual Framework and Guidelines for Establishing Geographic Information System Capable of Integrating Natural Resources Data and Socioeconomic Data for Development-Oriented Planning, Monitoring, and Research (Paris: UNESCO, 1984).

COMMENT

Ilan Salomon

Much of the paper provides a background on the state of information technology (IT) based planning in Asian and Pacific countries. This review is based on presentations made at a Regional Seminar on Information Systems for Subnational Development Planning, held in India in December 1985. The general picture is that in most countries the use of IT in planning is, at best, in its infancy or nonexistent. While lack of physical infrastructure and financing problems are major factors contributing to the gap between the Western world and developing countries in IT usage, the absence of skilled personnel and ways to overcome this particular barrier are the topic of this paper. The general trend towards decentralization of planning is an important reason cited by the author for the need to train large numbers of professionals in utilizing IT in planning.

The paper takes the perspective that information technology is, to a great extent, "technology-driven" and the main problem is how to acquire a "socioeconomic command" of it. Training is certainly one important route to achieve this.

The author makes an important distinction between various groups of trainees who require different skills. These are: the designers who manage the IT systems; the information collection and processing staff; and the users, who are divided into policy planning and decision making level and planning and development analysis level. He further stresses the importance of interaction between the various groups as a necessary element in the training strategy. For the two groups which comprise the users, another interesting distinction is made between "computer education" and "computer training." The former refers to educating users on what they should expect of IT and how they should make use of the information provided by the technology. The latter refers to the operation of the hardware and software.

While the paper provides many good arguments for why training should be developed for professionals in developing countries, and the need to develop integrated training frameworks, there is only a limited discussion on how these objectives can be met. That section can, and should be further developed, in line with the premise of "socioeconomic command."

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TRAINING NEEDS IN INFORMATION SYSTEMS FOR LOCAL AND REGIONAL DEVELOPMENT AND PLANNING IN DEVELOPING COUNTRIES

Peter Nijkamp in cooperation with Wouter de Jong

INTRODUCTION

The industrial revolution has meant a landmark in the history of mankind. The current "informatization" of our society, also denoted as the "informatics revolution," may mean another milestone in the development of modern societies.1/ There are, however, significant differences between the industrial and the informatics revolutions.

The industrial revolution was characterized by a large-scale geographical concentration of economic-technological activities and people at favourable places (due to natural resources, physical conditions, and so forth). The commodities produced in such industrial centres had to be shipped to regional, national, and even international marketplaces. Consequently, large-scale physical transport (of commodities or people) is one of the main features of the industrial society. This will be called "locomotion." The costs of the locomotive society are extremely high, not only in terms of direct transport costs, but also in terms of risks, traffic safety, congestion, environmental deterioration, and other externalities.

Therefore, it is no surprise that our postwar quarternary society has paved the road towards a blend of knowledge orientation and information transmission.2/ The resulting informatics revolution will no doubt have a profound impact on the functioning of our societies. It is increasingly realized that -- in addition to traditional production factors (such as capital, land, labour, and resources) -- information is also a production factor of major importance. Information appears to be the most appropriate tool to increase the efficiency of production, hence, to improve the competitive position of industrial sectors, regions, and countries.

Consequently, accessibility to information systems and fast data transmission are nowadays often more important than efficiency in physical transport. The logistics revolution and flexible automation in many large-scale, multiplant firms are good illustrations of this point. Instead of locomotion, we observe an increasing trend towards "infomotion."

"Infomotion" has a deep impact on the economic development potential of cities, regions, and countries. In the locomotive society the highest growth potential could be achieved by those areas which had the most favourable physical locational profile, as is clearly illustrated by the evolution of Western economies after the industrial revolution. In the "infomotive" society, however, a new spatial pattern may emerge, in which the competitive position of an area is mainly determined by its accessibility to information and telecommunication systems. This also implies that even peripheral areas in less centrally located countries have, in principle, an unexpected growth potential in the coming decades -- provided, of course, the new information technology is functionally connected with the regional growth potential concerned.

"Infomotion" is not only relevant in the context of entrepreneurial decision making, but it is equally relevant in the fields of public decision making (at both national and regional or local levels). In these cases, information is not only power, but often even ammunition. Therefore, the making of effective and efficient public policy badly needs an advanced planning environment oriented towards the use of modern communication and information technology, supported by well-trained personnel.

Public decision agencies sometimes fear that the information technology is only a modern variant of the old Delphi oracle. This is unfortunately a misguided perception of the potential offered by the informatics revolution. Accessibility to, and efficient use of, information make public decisions more competitive also. Clearly, the current terminology (e.g., artificial intelligence, learning machines, expert systems, fifth generation computers, acoustic sensor systems, or symbolic query languages) may make potential users somewhat suspicious and may even evoke a feeling of distrust. It should be realized, however, that all these developments in informatics, nowadays often denoted as Knowledge Information Processing Systems (KIPS), may - with "smart software" and an intelligent user -- enhance the quality of public decision making in terms of management, strategy, and effectiveness.3/ In conclusion, "infomotion" is nowadays an indispensable component of private and public decision making.

IMPORTANCE OF THE INFORMATION SECTOR

In contrast to the successive phases of the industrial revolution (mechanization, energy transmission, and electronics), the informatics revolution has a highly regulating and controlling potential which makes information and telecommunication extremely appropriate instruments in a policymaking context. This new development has three major features, viz., (a) high speed and reliability, (b) flexibility and adaptive potential, and (c) organizational and communicative power. Consequently, informatics will not become a substitute for private or public decision making, but it will enhance its quality by providing complementary tools.4/ In this respect one may assume that the "wealth of nations" (apologies to Adam Smith) will be determined by the "wealth of information." This, of course, also holds true at a subnational level for the "wealth of regions." Thus, the distribution and use of modern information and telecommunication technology will exert a decisive impact on the distribution of welfare among regions.5/ Free access to information and knowledge networks is therefore of paramount importance for the balanced development of a country or a global economy.

Information has become the driving force and the integrative foundation for public planning and decision making, and consequently, information systems have become indispensable vehicles at all levels of planning and policymaking. Availability of relevant data and presence of operational tools for monitoring the evolution of spatial systems are important ways of enhancing the quality of decisions of public agencies, in particular if they take into account the organizational (institutional and managerial) structure of these agencies.

In view of the increasing importance of information for management and decision making, it is no surprise that the information sector has grown dramatically. For instance, Naisbitt claims that approximately 60 per cent of total employment in the USA is information-oriented.6/ Despite this growth, it is interesting to note some disenchanting observations made by Jonscher, who claims that the contribution of the information sector to final (consumer) expenditures is relatively low (approximately 7 per cent) and that it is more the turnover and substitution rate within the quarternary sector that is higher than the absolute total growth.7/ On the other hand, the indirect productivity increases caused by the information sector may be very significant. In general, the employment generating effects of the information sector are still fairly modest, while the assessment of these effects is fraught with difficulties and uncertainties. For instance, the information technology market is highly segmented and mainly composed of three different segments, viz., computers (mainframes, micros, software, etc.), telecommunications (transmission via satellites, microwaves, fibre optic, cable, videotex, etc.), and microelectronics (chips, microprocessors, etc.).8/

Despite many uncertainties regarding measurement, it is clear that the information sector has grown in importance over the past decades. For instance, the telecommunications industry, being only a small part of the informatics sector, already absorbs 1 per cent of the GNP in the OECD countries annually.9/ This importance is also illustrated by figure 1, based on a report in Business Week. The same journal also states:

> The old industrial society that generated wealth in the form of capital goods and manufactured products is giving way to a new society valued in terms of intangible assets, such as knowledge and information processing. In fact, for fifteen years more people have been working at processing information than any other type of job.10/

An interesting contribution to the discussion of the importance of information technology for corporate strategy has been made by Goldhar and Jelinek, who emphasize the economies of scope -- in contrast with the economies of scale -- offered by this technology.11/ This means that information technology allows an integration of all economic, organizational, and technological functions (such as engineering and marketing) in one organization, so that the process predictability, timely delivery, quality, and efficiency can be improved without losing flexibility and variety. The capabilities of such information-based systems for manufacturing processes are:

(1) Extreme flexibility in product design and product mix, which allows for an almost unlimited variety of specific designs within a reasonable family of options, including alternative materials.

(2) Rapid response to changes in market demand, product design and mix, output rates, and equipment scheduling.

(3) Greater control, accuracy, and repeatability of processes, all of which lead to better quality products and more reliable manufacturing operations.

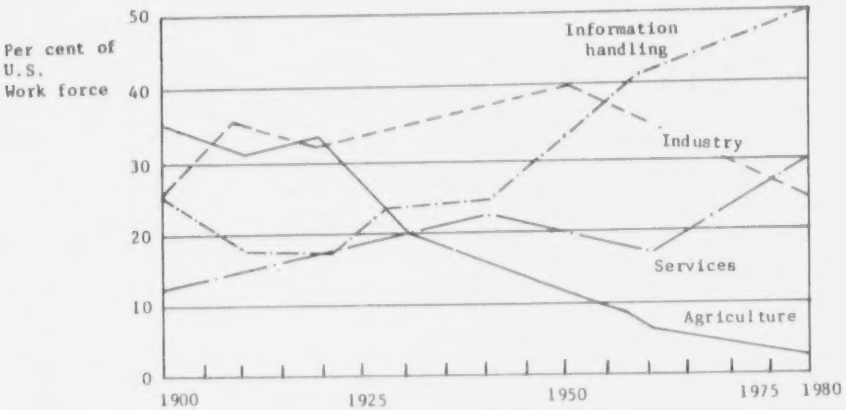
(4) Reduced waste, lower training and changeover costs, and more predictable maintenance costs.

(5) Greater predictability in all phases of manufacturing operations and more information, both of which make possible more intensive management and control of the system.

(6) Faster throughput due to better use of all machines, less in-process inventory, fewer stops for missing parts or materials, or machine breakdowns. Higher speeds are now made possible and economically feasible by the sensory and control capabilities of the "smart" machines and the information management abilities of the Computer Aided Manufacture (CAM) software.

(7) Distributed processing capability make possible and economical the encoding of process information in easily replicable software.

Figure 1. Employment Trends in Four U.S. Sectors (1900-80)



Source: Business Week, 30 June 1980, p. 104.

The same authors also claim that the differences between traditional technology and Computer-Integrated Manufacturing in factories and organizations can be indicated as follows:12/

Traditional Technology	Computer-Integrated Manufacturing
Centralization	Decentralization
Large plants	Disaggregated capacity
Balanced lines	Flexibility
Smooth flows	Inexpensive surge and turnaround ability
Standard product design	Many custom products
Low rate of change and high stability	Innovation and responsiveness
Inventory used as a buffer	Production tied to demand
"Focused factory" as an organizing concept	Functional range of repeated regionalization
Job enrichment and enlargement	Responsibility tied to reward
Batch systems	Flow systems

Such new technologies will have a far-reaching impact on the locational pattern of firms, hence on regional development. Modern technology also offers a large growth potential for traditional rural areas, provided these areas are connected with an information and knowledge network. Thus, the "infomotive" capability of a region will be decisive for its future economic position.

Clearly, the new information technology (NIT) may also exert impacts on mobility behaviour of people (e.g., teleshopping or teleconferencing). However, the significance of the effects of such technologies on spatial behaviour is still doubtful.13/ The use of modern telecommunication facilities technically enables the substitution of physical commuting by telecommuting, so that more jobs cease to require physical travel. However, Salomon indicates that the social costs borne by the individual telecommuters are likely to discourage wide-scale transitions to this type of work.14/ He arrives at the following conclusion:

> Telecommuting is presented in most of the literature as a new remedy to the ills associated with vehicular commuting. On the other hand, work at home imposes a radical change of life-style on most individuals. At present there are numerous indications that the change is not positive, as initially perceived by some writers. Unlike other technologies which may be implemented by employers and which employees are required to use (e.g., teleconferencing), the intrusion of the work role into the home environment must be a cooperative effort if the welfare of the individual is to be considered. It is therefore contended that there is only a small probability that the stated promises will be achieved. The options of neighbourhood or satellite work centres seem more viable. The option of working at home should be evaluated only for a limited number of segments of the

labour force. In the future, the monitoring of values may indicate changes toward greater acceptance of such interwined patterns of work and home roles.15/

Altogether, the new spatial (urban and regional) picture that is likely to emerge due to the use of NIT is one of a moderate deconcentration, both from large metropolitan areas to medium-sized cities and from central regions to more intermediate regions. Also in a regional and urban policy context new horizons are emerging. Regional and urban policy is increasingly moving towards a spatially-oriented telematics and informatics policy in order to fully benefit from the growth potential offered by modern information technology.16/ Also in a broader planning and policy context, informatics may play a decisive role, as will be illustrated in the next section.

INFORMATICS IN URBAN AND REGIONAL PLANNING

Although modern societies are increasingly exhibiting the features of an information society, this does not necessarily imply that regional and local authorities are fully using the potential offered by modern information technology. Despite available possibilities, it has to be realized that the existing systems of information (statistics and specialized operative systems) are often incomplete, inconsistent, and insufficiently oriented towards the needs of the analysis of geographical aspects of regional and local socioeconomic, land use, and environmental planning. This situation leads to a lack of data for models, gaps in adequate use of information for the decision making process, and difficulties faced by users in making consistent decisions and in implementing models and techniques. Hence, the obvious problem is: How to fulfill the needs of information for planning integrated regional or national development.17/

In general, information serves to assess impacts of policy decisions and to maximize the success of policies. In contrast to the past, we are now observing a tendency towards systematic, comprehensive, future-oriented information systems. A major problem, however, is caused by conflicting aims regarding such information systems; for instance, the desire for complete versus manageable information systems, the desire for centralized versus decentralized information systems, or the desire for a timely release versus reliability of information systems. In principle, it should be recognized that redundant information is as equally unsatisfactory as lacking information. Both cases are less efficient, and hence, increase costs, risks, and abuses of information.18/

Useful judgement criteria for the quality of urban and regional information systems (and hence, for the choice of information to be included) are:

- availability
- actuality
- accessibility
- consistency
- completeness
- relevance
- pluriformity
- comparability
- flexibility
- measurability
- comprehensiveness
- effectiveness
- versatility
- validity

Despite the available information technology, it should be noticed that the actual use of this technology and of advanced information systems for local and regional planning is still very modest. An illustration of this statement can be found in a cross-national comparison of regional information systems in various countries.19/

At each planning level and for each planning problem, information is needed to support decisions. Information is necessary to reduce the usual uncertainties with which planners and decision makers have to cope regarding the effects of their decisions. Nijkamp gives eight dimensions of a decision problem that influence the impact of a planning decision and thus the proper choice of a specific planning problem solution:20/

(1) frequency of the choice situation,

(2) range of impacts from a decision,

(3) number of spillover effects to other systems,

(4) number of conflicts involved in implementing a decision,

(5) financial consequences of a decision,

(6) time horizon of impacts from a decision,

(7) number of actors involved in making the decision, and finally,

(8) the degree of uncertainty regarding the outcome of the decision.

Such rules of thumb may be helpful in designing effective information systems for regional and urban planning, as will be indicated in the next section of this paper.

In the light of the previous results, an obvious question is, of course: What could be done in order to improve the current situation and enhance the efficiency and efficacy of informatics in local and regional planning? First of all, it has to be recognized that the future of planning will involve more, rather than less, data, information, and intelligence. Consequently, the skilled practitioner, with a commitment to implementation, should be able to weave information and intelligence into the local and regional decision making and policymaking processes by clear and operational devices, with a particular emphasis on both the limitations inherent in the methods employed and the (hidden) values incorporated in assumptions and manipulations.

Consequently, three mutually interrelated fields are of great importance here, viz., hardware, software, and "orgware."

Hardware concerns the information technology, and the focus of attention is on technological devices and equipment (computers, composers, etc.) that facilitate the handling of large data sets in order to transform them into structured information. The major advantage of current technology is that it allows a decentralization of hardware (e.g., micros linked to a mainframe), so that local and regional authorities (even in peripheral areas) may have, in principle, access to an information and knowledge network.

Software concerns the handling, retrieval, and transformation of data in order to make them suitable for decision and policy purposes. The enormous progress made in recent years leads to a situation where too many software packages obfuscate the insight into the real potential of a specific software. User-supplier interaction, appropriate training facilities, and a clear view on information needs are necessary conditions for a satisfactory use of software.

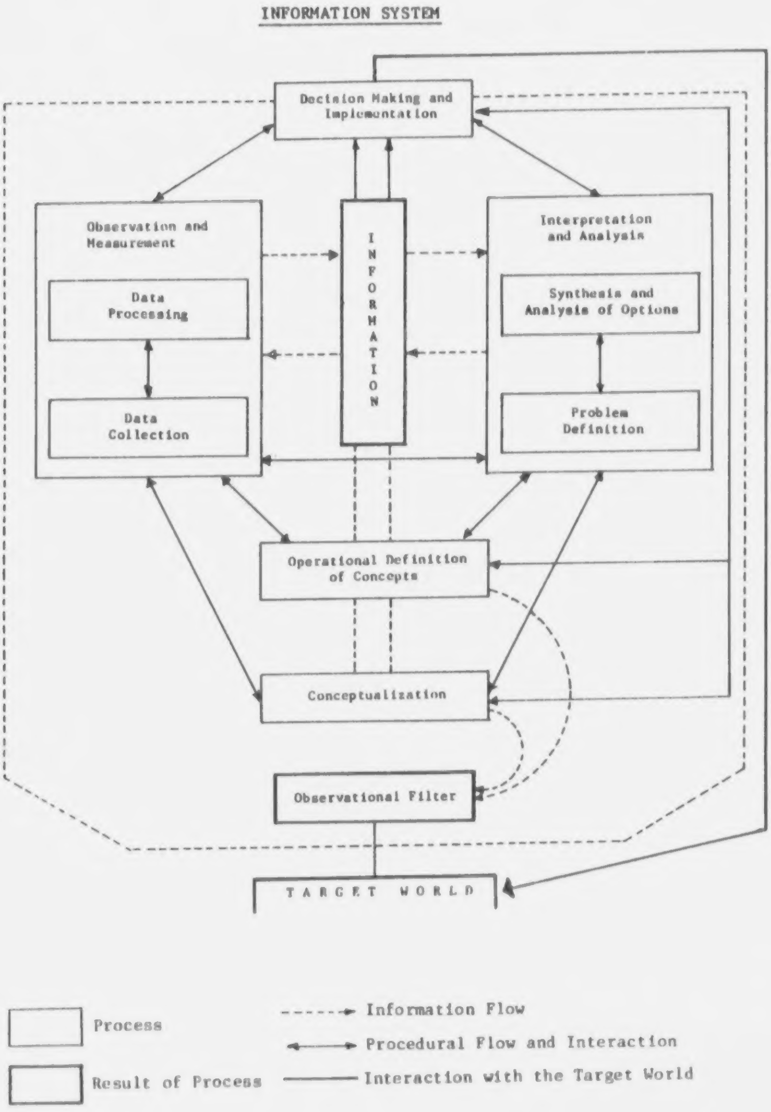
Finally, "orgware" is perhaps the most important issue in this field. The organization structure for using knowledge, information, and opinions in a coherent way has often been a stumbling block. This requires a clear division and coordination of tasks among operations staff, heads of data processing departments, administrative personnel, and decision makers. Clearly, permanent monitoring and evaluation is of paramount importance.21/

Informatics is -- as said before -- nowadays an indispensable component of planning and decision making. It serves to reduce the uncertainties regarding the impacts of decisions taken, the reactions of people affected by decisions, and the influences exerted by unexpected or unforeseeable external events. In general, an informatics expert should be aware of the linkages in an interwoven social system in order to be able to assess all relevant direct and indirect responses to a stimulus. Consequently, it may be meaningful to adopt a systems view on the role of information in (public) decision making (see figure 2).

It is worth noting, however, that such a systems view does by no means imply a large-scale and technocratic view on public decision making. In the past years, we have seen a shift away from massive machine-dependent information systems characterized by remoteness, inflexibility, and centralization towards small-scale, decentralized, user friendly, and interactive systems. Instead of mainframe based corporate information systems, we are observing now the emergence of desk-top microsystems. It is worth noting, however, that from a technological viewpoint, nowadays the debate on small-scale versus large-scale information systems (or of decentralized versus centralized information systems) is almost outdated, as technological progress allows both centre and periphery, large and small, to coexist as never before. The desktop micro can be a work station linked to a telecommunications network which includes access to the computing capacity of the largest machines.22/ Thus, technological developments in recent years have meant that it is increasingly easy for user departments in local governments to get access to computers. Computers are becoming smaller, cheaper, easier to communicate with, and, thus, more accessible to users.23/

These developments in hardware and communications have been reinforced by software design which has identified greater computer usability as the key to more effective use. There is a growing need for efficient and effective use of packaged software. Apart from cost considerations, this adjusted software is also intended to be implemented and used by nonexperts without the need for specialized programming advice and with a

Figure 2. Information as the Centre of Decision Making


INFORMATION SYSTEM
Decision Making and Implementation
Observation and Measurement
Data Processing
Data Collection
INFORMATION
Interpretation and Analysis
Synthesis and Analysis of Options
Problem Definition
Operational Definition of Concepts
Conceptualization
Observational Filter
TARGET WORLD
Process
Result of Process
Information Flow
Procedural Flow and Interaction
Interaction with the Target World

Source: D. C. Alonzo, "Food and Agricultural Statistics in the Context of a National Information System" in Proceedings of the Urban Data Management Symposium on Information for Local Authorities, The Hague, June 1985.

minimum of training. Clearly, these recent developments in software availability have therefore led to growing independence of users from central mainframe systems or specialized departments.

This tendency has also been induced by the dramatic change in the local government operational environment. Tight central government control on scarce resources, coupled with new auditing procedures have led (together with the supply of new technological equipment) to pressures on local governments to become more efficient and effective in the use of scarce resources. This also explains the tendency towards an increasing use of decision support systems. According to Farthing, features of such a system are that:

(i) it focuses on the decisions actually faced by managers within organizations. Therefore, unlike some approaches to information systems development, it is rooted in the decision making problems faced by the personnel;

(ii) it deals with problems that are semi-structured, i.e., either the nature of the problem, the possible courses of action, or the criteria for choice are unclear or uncertain;

(iii) the computer and the manager can make a "better" decision than either alone.

How can these ideas be applied to the process of decision making for development control? First, planners in development control are faced with the task of making recommendations to the politicians on the local authority planning committee about applications for the development of land. Detailed practice varies between authorities. In some authorities and for certain usually well defined classes of application, responsibility for decision making is delegated to the planning officers. The decision making problem is therefore one that is faced regularly and routinely as part of the job by planners in development control.

Secondly, the decision making problems faced by planners fall into the category that are neither completely structured nor completely unstructured. In a few cases the planning application falls into a category where there is a clear policy (for example an application within the greenbelt around a major city). Here the appropriate decision may be well defined. In other cases, there may be clear rules for dealing with particular types of application (rules governing the nature of advertising signs, for example). No cases are however completely unstructured. The proposal on which a decision has to be made by the planning authority has to be clearly set out in the application. The alternative courses of action that the authority can take are also clear. The application can either be refused, permitted, or a conditional permission may be given. In practice this latter alternative does give more flexibility and openness to the range of possible courses of action. Nevertheless, there is often a standard set of conditions that are used to qualify permission. The major variable and therefore uncertain area of the decision problem relates to the criteria for choice. As is well known, decisions on urban development proposals may involve multiple, ligitimate, conflicting goals.

The third feature of decision support systems is that the computer and the decision maker together will do better than either alone. As suggested in the introduction to this paper, data bases of planning applications and decisions are being built up in a number of authorities capturing past decisions within development control. Why might this provide useful information to support current decision making?

There are four ways in which precedent may be useful. The first is where the study of past applications and decisions might help to establish on a post hoc basis the policy which has emerged to deal with a particular class of applications and which will therefore provide a starting point for future decisions. This facility may be particularly useful where there is an absence of formal policy guidance, where a number of planners are making recommendations, or where decision making may be divided on an area basis (as appears commonly the case) within a district.

There is a second and related reason for wishing to establish past decisions, and this stems from a desire for consistency in the application of decision making. Equity demands that all relevantly similar cases should be treated in the same way.

The third use of an investigation of past decisions is to monitor (where relevant) the implementation of policy. If structure or local plans give targets for development in towns or villages, then a knowledge of the number of permissions granted compared with policy targets for a particular period is essential. In relation to residential development, this is at the moment an important issue for planning authorities.

Finally, an investigation of past decisions could be useful in establishing the likely issues that would be raised by applications of a particular type. The "model" implicitly used in the previous decisions could be built on and used by other people in the authority. There would thus be the possibility of learning from experience.24/

Despite the prospects offered by decision support systems, there appear to be in planning practice various bottlenecks that sometimes preclude a fruitful application of these systems. Three major categories of bottlenecks are:

(1) attitudes of planners to modern informatics, often caused by lack of training or fear of job losses;

(2) technology features, mainly due to lack of appropriate access to computer systems; and

(3) data characteristics, often caused by insufficient or redundant information.

These stumbling blocks once more show the need for proper training and education in informatics.

TRAINING AND SKILLS IN INFORMATICS

The informatics sector is part of the modern technology sector. A full use of the potential of this sector requires two complementary policy approaches, viz., an adequate manpower and labour market policy from the side of the government (a macro and meso strategy) and an effective training and skill policy at the level of firms and organizations (a micro strategy).25/

First, manpower and labour market policies regarding the high tech sector (including the informatics sector) may have different forms, such as:

(1) Programmes to enable workers to obtain new skills in response to changing technology;

(2) new training programmes in areas of critical occupational shortages;

(3) job development to provide the long-term unemployed with renewed access to the informatics labour market;

(4) innovation programmes to stimulate the invention of new ideas and the application of experimental programmes in the informatics sector; and

(5) investment programmes in human capital, with a particular emphasis on R & D informatics.

Altogether, public capital investments and strategic manpower policies are required from governments in all countries in order to face the problems emanating from the application of advanced technologies.

In the second place, it is also clear that the implementation and use of information technology require many efforts from the side of firms or institutions which want to introduce new hardware and software, in order to keep their production processes and managerial structures current and competitive. In particular, in an urban or regional context much public support is needed for retraining personnel in order to take advantage of the information technology and their employment creating potential.

It is worth noting that new training programmes should not be exclusively oriented towards achieving skills in the use of hardware and software, but also (to a large extent) towards providing understanding of the supportive conditions for an efficient use of the potential offered by informatics (e.g., social, legislative, and organizational infrastructure).

Thus, firms and organizations have an important task in upgrading the education and skill competencies of the labour force. In addition to improving the short-term adaptive mechanisms for facilitating changes in the labour market, there is also a need for more structural changes in what the mainstream education and training institutions prepare people for and how they do it. This also implies that the popular notion of "permanent education" may become less relevant in the information sector, as the rapid and discontinuous changes in this field reduce the life expectancy of certain occupational skills. Consequently, a highly specialized informatics training programme runs the risk of soon becoming obsolete, and therefore it may be meaningful to build institution-based training and education around basic and generic skills in the broader field of information (and communication) sciences, which might provide the platform for more specific firm-tied training. This type of education should then be supplemented with opportunities for recurrent education and training for employed people in order to renew their occupational skills and to provide the potential to enter new occupational areas. What is needed here is in fact an education in an "informatics culture" where a computer-based and information-oriented society interferes with the way people make decisions, go out for shopping, communicate with others, and respond to policy decisions. The current high unemployment among youth in many countries is a glaring example of the inability of our society to respond adequately to the constraints and the potential offered by the informatics revolution.

The necessary labour force and training policy for informatics depends on two different dimensions, viz., the hierarchical decision (or policy) structure and the sectoral division of policy tasks (figure 3). In terms of hierarchical structures, one may make the conventional division into the triple-layer structure, viz., the national, regional, and local levels.

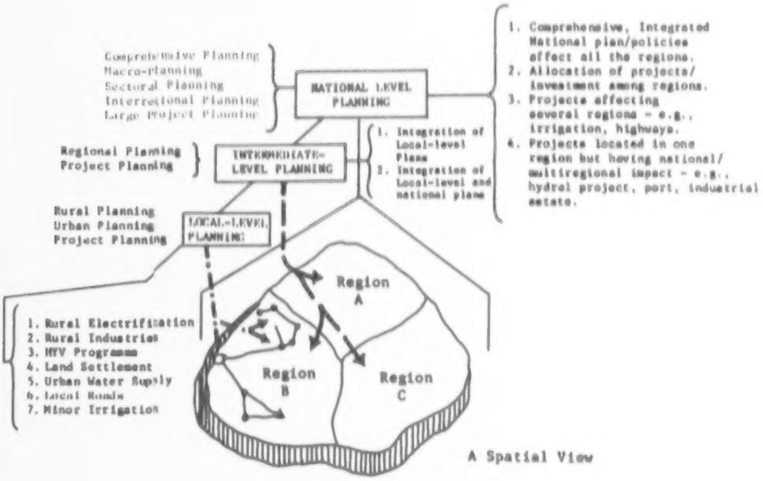
National (N)

The national level, in most modern societies, is the aggregate policy level at which global decisions regarding the national economy are taken. Usually, the spatial aspects are suppressed at this level, although -- given the frequent emphasis on regional planning (like infrastructure, amenities, police, etc.) -- sometimes a spatial dimension is by necessity included at the national policy level. For instance, a policy of flood protection requires decisions where to construct dams, pumping stations, and so forth; or an agriculture policy needs decisions as to how much and where to cultivate certain crops. Although, in general, information at the national level is fairly global, there is a need to collect many coherent data in order to assure consistency in policy making. In this context, the training needs are more oriented towards efficient data collection, storage, and retrieval and towards the design of general evaluation schemes and models for national policymaking. In such cases, often broad future development scenarios have to be developed based on global trends without too much specificity regarding impacts of policies.

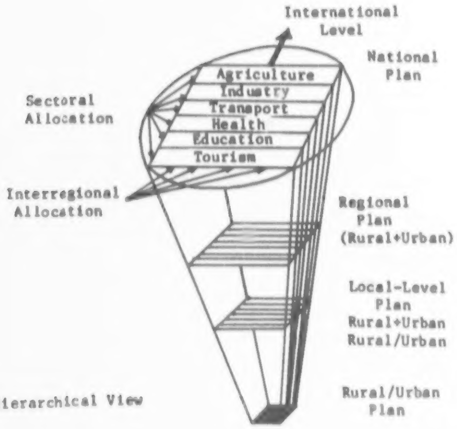
Regional (R)

Regional planning has become an established part of policymaking in most countries, not only because of the need for efficient decisions in view of the size of a country, but also because of the need to do justice

Figure 3. A Comprehensive Planning Framework


Comprehensive Planning
Macro-Planning
Sectoral Planning
Interregional Planning
Large Project Planning
NATIONAL LEVEL PLANNING
1. Comprehensive, Integrated National plan/policies affect all the regions.
2. Allocation of projects/investment among regions.
3. Projects affecting several regions - e.g., irrigation, highways.
4. Projects located in one region but having national/multiregional impact - e.g., hydrel project, port, industrial estate.
Regional Planning
Project Planning
INTERMEDIATE-LEVEL PLANNING
1. Integration of Local-level Plans
2. Integration of Local-level and national plans
Rural Planning
Urban Planning
Project Planning
LOCAL-LEVEL PLANNING
1. Rural Electrification
2. Rural Industries
3. HYV Programme
4. Land Settlement
5. Urban Water Supply
6. Local Roads
7. Minor Irrigation
Region A
Region B
Region C

A Spatial View


International Level
National Plan
Agriculture
Industry
Transport
Health
Education
Tourism
Sectoral Allocation
Interregional Allocation
Regional Plan (Rural+Urban)
Local-Level Plan Rural+Urban Rural/Urban
Rural/Urban Plan

A Hierarchical View

Source: H. D. Dias, "More Effective Use of Available Information" in Proceedings of the Urban Data Management Symposium on Information for Local Authorities, The Hague, June 1985.

to interregional equity problems. In this framework, regional and sectoral policies often run parallel. Within the regional context, one may face the same problems as at the national level, but there is also one major difference, viz., the fact that regional planning is being designed at the crossroads of national and local planning. This implies that informatics experts at the regional level should in general be much more concerned with multilevel consistencies than those at the national level. In addition, regional planning is also more concerned with concrete public projects, like highway planning or irrigation planning. This also implies that information experts at this level need satisfactory training in more detailed and more real world monitoring systems for concrete programmes and projects.

Local (L)

At the local level, one is usually confronted much more with low-level administrative problems and procedures. On the other hand, one is increasingly observing a higher importance attached to metropolitan, local, or even district information systems. Clearly, in such cases, many concrete and often small-scale projects have to be served by these information systems. Such systems have to be compatible with regional and national information systems, but they should also benefit people specifically, as at the local level one has to deal with specific problems affecting specific groups which require specific treatments and/or solutions.

In conclusion, the information need varies according to the hierarchical level of policies to be pursued, and consequently also the training needs vary: from more global informatics training (dealing with macromodels and scenarios) at the national level to specific and detailed informatics training (based on small-scale monitoring and retrieval systems, qualitative impact analysis, and specific data collection techniques).

In the second place, policymaking and planning is usually policy oriented. This means that in many countries information systems exhibit a similar compartmental structure, so that one may observe a wide variety of different sectoral information systems, like agriculture, hydrology, land use, industry, transportation, health, education, tourism, informatics, and so on. Two points are to be made in this framework. First, the degree of necessary sectoral detail is usually increasing at a lower hierarchical level, and secondly, there is always a need for systematic and coherent data collection and monitoring among all sectors involved.

Both the abovementioned hierarchical and sectoral dimensions are included in figure 4.

Figure 4. Hierarchical and Sectoral Structure of Information Systems

	Sectors
N	
R	
L	

Figure 4 also demonstrates the need to pay explicit attention to various agencies or departments involved in the design of information systems. Various tasks can be distinguished here:

(1) Data collection (census, statistics, surveys, etc.);

(2) data processing (administrative registers, monitoring, statistical records, etc.);

(3) data transmission (retrieval systems);

(4) data transformation (modeling or scenario analysis); and

(5) data interactions (decision support systems, expert systems, etc.);

Clearly, each of these tasks requires a specific skill, although it has to be added that a "mature" informatics expert should be trained in all the abovementioned tasks.

Having discussed the caveats inherent in the design and development of an information system for effective planning, we will discuss in the next section a strategic information system as a specific case of an operational decision support system for long-term regional planning.

A STRATEGIC INFORMATION SYSTEM DESIGN FOR LONG-TERM REGIONAL PLANNING

How can we fulfill the need for an appropriate strategic planning information system? In recent years the design of strategic information systems has not exclusively been left to engineers and systems analysts, but increasingly also to planners (in both the public and private sector). This transition has called for more attention to the integration of information system design in strategic planning procedures. In the present section, the design of such a strategic information system will be discussed at the regional level. The aim is to propose an accessible and flexible information system in order to provide an operational basis for an effective, offensive, and future-oriented regional socioeconomic policy. Socioeconomic policymaking at the regional level has increasingly become a problematic activity, due to the open nature of regional economies, the diffuse demarcation of various sectors, the impact of international developments, and the frictions emerging at the local level. Furthermore, the regional level is increasingly becoming a battlefield between conflicting interests; for instance, national, regional, and local interests meet each other at the regional level. Consequently, regional authorities feel an increasing need for a reliable, effective, and prospective socioeconomic information system.

In order to focus our study more precisely, it is assumed that socioeconomic policy is the main point of departure for the design of the information system for the region concerned. Linkages with other policy sectors in the region will only be taken into consideration if they are related to the socioeconomic system. Furthermore, the lower level of the information system to be designed is the supra-local level, so that purely municipal information systems are left out for the time being. In designing such an information system various problems may emerge:

(1) Under-information, i.e., the level of information is too low to be of use for complex policy problems;

(2) over-information, i.e., the level of information is too high to assure structured decisions;

(3) misinformation, i.e., a qualitative discrepancy between demand and supply of information;

(4) incoherent information, i.e., lack of coordination between information related to multiple policy sectors or levels; and

(5) non-actual information, i.e., the necessary information is not available on time.

The design of information systems for regional policy is made more difficult due to recent developments in public policy in many countries, viz., decentralization, deregulation, and orientation towards the market sector. In spite of these new directions, however, regional policy needs information for the development, implementation, and evaluation of policies in any case. In this context, a strategic information system serves to provide regional policy with an effective and future-oriented information system. Elements of such a system will be further discussed later on.

Supply of Information

A first step in the design of an information system is an inventory of the supply of available information. Three aspects have to be considered in this respect:

(1) Information for regional socioeconomic planning is usually multidimensional in nature, so that a regional socioeconomic information profile is necessary.

(2) Information is usually provided by various institutions and agencies, at the national, regional, supra-local, and local level, so that a multilevel information supply is to be considered.

(3) Information may be judged from both a quantitative and qualitative viewpoint in order to account for a reliability bias.

The regional socioeconomic information profile proposed here is composed of seven main subsets, viz.:

(a) Employment (such as jobs, levels of skill, unemployment changes, and commuting size);

(b) economic structure (such as technology, science parks, high-tech, industrial structure, and changes in economic sectors);

(c) production environment (such as locational factors, investment subsidies, venture capital, available industrial areas, and job migration);

(d) housing market (demand and supply of dwellings, and occupancy rates);

(e) demography (population size and growth, and migration);

(f) amenities (physical infrastructure and communication network); and

(g) energy and environment (purification plants and alternative energy supply);

The multilevel information supply may be distinguished according to three sublevels:

(a) national (e.g., Central Bureau of Statistics);

(b) regional (e.g., provincial research institutes); and

(c) local (e.g., municipal statistical offices).

Most of these institutions are (semi-)public, but private institutes gathering and providing information may also play an important role. The structure of information supply can be represented by means of an information supply matrix (see figure 5).

Information Need

The needs for information can also be distinguished according to the relevant spatial levels and the elements of the information profile, although as far as the spatial level is concerned the demanders of information may differ from the suppliers. This leads to an information demand matrix, which has essentially the same structure as figure 5.

Confrontation of Supply and Demand

By confronting the need for regional socioeconomic information with the available supply, one may identify the bottlenecks in a regional information system. Such a bottleneck analysis may be based on the following judgement criteria:

(1) Frequency of provision (and mutation) of information;

(2) spatial level (degree of spatial aggregation);

(3) static versus dynamic information;

(4) level of detail;

(5) completeness (including reliability);

(6) accessibility (including costs); and

(7) standardization and integration.

Figure 5. An Information Supply Matrix

Socioeconomic Information Profile

Multilevel Information Supply

	1	2	3	4	5	6	7
N							
R							
L							

The bottleneck analysis can be based on an information input-output matrix (see figure 6), which gives a structured representation of the information network or regional socioeconomic policy. Each entry of this matrix indicates the existence of a linkage between supply and demand (both in a qualitative and a quantitative sense). Clearly, indirect links may also be traced in this matrix. The following general conclusions — based on empirical research in the Netherlands -- may be inferred from the bottleneck analysis:

(1) In general, information in a quantitative sense is sufficiently available in order to analyse the regional labour market, the production structure, and the production environment.

(2) There are, however, many overlaps in the information supply, so that in many cases incoherences may emerge due to different data sources, geographical aggregation levels, different time periods, different definitions, and so forth.

(3) In general there is a lack of strategic information on new trends in industries, new locational conditions, strengths and weaknesses of industrial areas, and the like.

(4) The timely availability of necessary information is a major bottleneck for effective use of information in regional socioeconomic policies.

Figure 6. An Information Input-Output Matrix

Multilevel Information Need

Multilevel Information Supply	N	R	L
N			
R			
L			

Framework of a Strategic Regional Information System

Information systems are intermediate tools in regional planning and policymaking. However, in many situations the goals and instruments of regional policies are not explicitly or precisely formulated, so that the design of a strategic information system is fraught with many difficulties. Efficiency goals and equity considerations are often intertwined and also influenced by many constraints and conditions, so that regional policy is (by definition) multidimensional in nature. The integration of multiple levels and of multiple elements of an information network is a matter of the utmost importance.

The elements of a regional information profile (discussed above) may be distinguished into three subsets of information content, viz.:

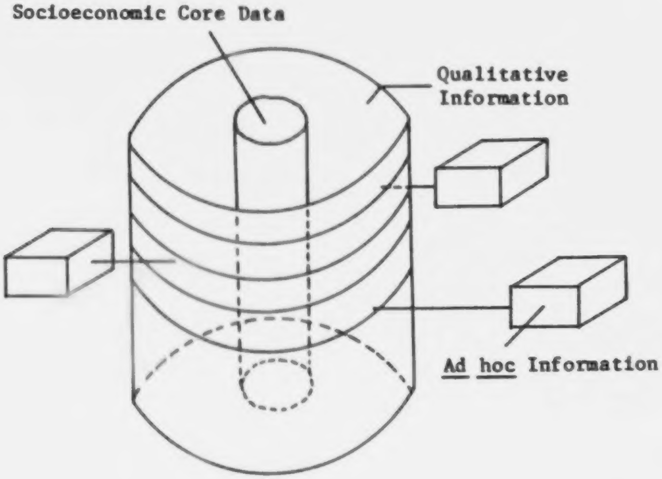
(1) socioeconomic core data, i.e., information that is collected on a permanent basis and that provides a reliable statistical representation of the major socioeconomic data in the region at hand;

(2) qualitative information, i.e., information that represents the stronger and weaker aspects of the region concerned in terms of its development potential and the importance of its infrastructure; and

(3) *ad hoc* information, i.e., information which is necessary for acquisition of new entrepreneurs, project design and judgement, and plan evaluation.

The foregoing notions can be integrated in a so-called planning information system, based on a satellite structure (see figure 7). The core of the model is made up of a permanent information flow, while the periphery of this model comprises the qualitative information, which is in turn attached to ad hoc information blocks.

Figure 7. A Planning Information System



Technically, the implementation of such a planning information model is feasible, as both the present hardware and software allow us to operationalize this system. The "orgware" requires, however, an appropriate institutional arrangement, which comprises all relevant policy agencies in the region at hand. In addition, the implementation of such a system would require a regional coordinating agency which -- on the basis of expert views -- provides directives regarding the structure and contents of the regional planning information system concerned.

GEOGRAPHICAL INFORMATION SYSTEMS (GIS): FEATURES AND TRAINING NEEDS

Information systems are by no means purely theoretical constructs, but need fine tuning to the specific purposes to be served. They must take into consideration the needs of the public, the objectives of policymakers, the democratic procedures in a country, the protection of individual privacy, the impacts exerted by and on planning organizations, the educational and training requirements that are necessary to implement them, and the planning culture and style in a certain country. Consequently, the recruitment and training of technical personnel (engineers, systems analysts, software experts, and external consultants) require careful consideration, as without due attention given to the necessary skills of informatics personnel, an information system is bound to fail. In this respect, a comparative analysis of failures made in the use of other information systems may shed much light on the specific training policy needed in a given planning organization. Once more it has to be emphasized that the task of an informatics expert is not limited to the collection and storage of data, but is much more oriented towards the transformation of data in an analytically structured way so as to make them suitable for urban and regional planning uses. Data, as such, have no use unless they are tailor-made and structured as strategic information for planning and policymaking (see figure 8).

The latter remark also implies the need to train experts and users in the area of computer-assisted decision making, based, for instance, on interactive user dialogues (e.g., via a micro-based computer system linked to a terminal and then to a mainframe). Furthermore, each information system needs an interface for end users who are not computer specialists.

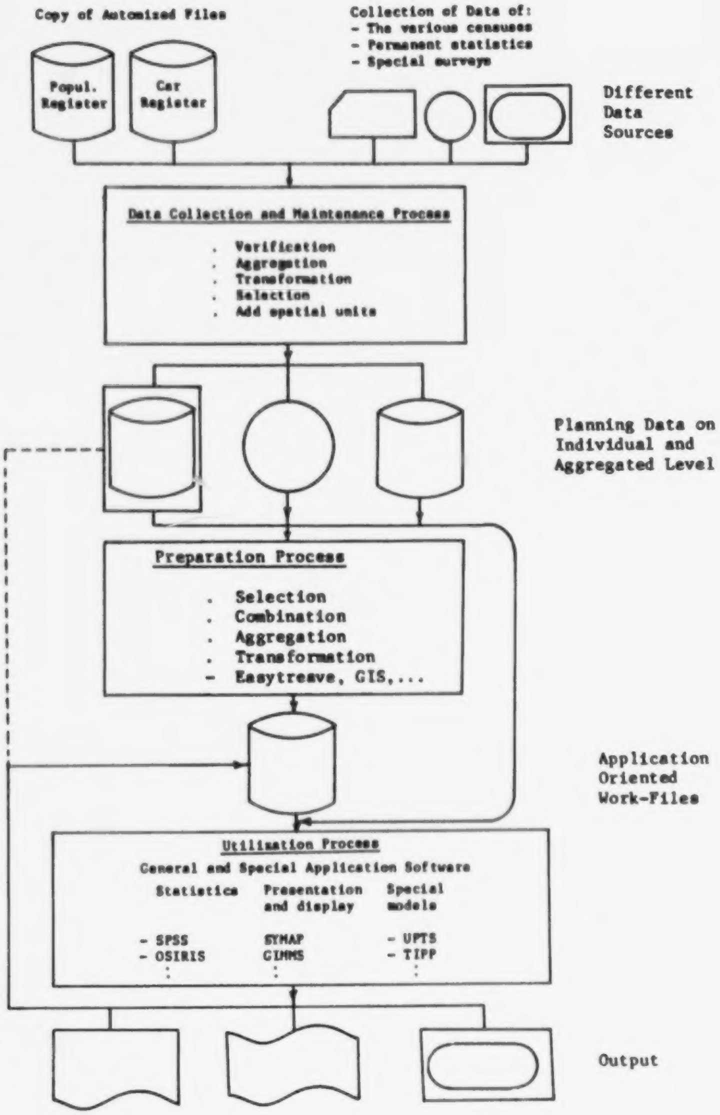
In the case of urban and regional planning, both experts and users have to be familiar with spatially-oriented or geographical information systems, as otherwise a planning agency may become too much dependent on external expertise and know-how (implying the risk of discontinuity and insufficient documentation). For both experts and users, it may be desirable to establish networks of information exchange for evaluating failures and successes of such geographical information systems in order to effectively redirect research and training on planning information systems at an urban or regional scale. In this respect, much attention has to be given to bottlenecks for an efficient implementation and use of geographical information systems, while also well-structured pilot studies on a small scale may provide much insight.

Does a geographical information system differ from a "normal" information system in terms of contents, scope, or use? And does the handling of a GIS require special training? These questions will now be further dealt with.

In general, a spatially-oriented information system comprises the spatial dimension as an essential component. A locational dimension (e.g., the point location of a firm or the physical distance between urban amenities) does not only enlarge the information content of a data system, but also provides a more profound and coherent insight into underlying structural spatial patterns. The current segment methods (integrating points, lines, and polygons on a map) are especially suited for socioeconomic urban and regional planning, as they usually take the physical infrastructure as a representation of the spatial reality and thus provide more possibilities to visualize spatial interrelations. Grid systems, however, show their applicability in environmental and natural resource related planning where it is impossible to construct a uniform rowing system or spatial structure to relate to. Moreover, the latter appears to be much more powerful in modeling and mathematical spatial operations.

Nevertheless, the segment method is a very powerful tool in a GIS, as it is oriented to regional and urban planning, and it is also suitable for efficient computer applications and thematic mapping purposes. The necessary input data for the use of a GIS can be obtained from various sources (e.g., digitizing of maps, stereoplotting of airphotos, or scanning of remote-sensed pictures from satellites).

Figure 8. Overview of the Programmes and Their Connexions to the Steps in a Planning Process


Copy of Automized Files
Popul. Register
Car Register
Collection of Data of:
- The various censuses
- Permanent statistics
- Special surveys
Different Data Sources
Data Collection and Maintenance Process
. Verification
. Aggregation
. Transformation
. Selection
. Add spatial units
Planning Data on Individual and Aggregated Level
Preparation Process
. Selection
. Combination
. Aggregation
. Transformation
- Easytreave, GIS,...
Application Oriented Work-Files
Utilization Process
General and Special Application Software
Statistics
Presentation and display
Special models
- SPSS
- OSIRIS
SYMAP
GIMMS
- UPTS
- TIPP
Output

Source: J. van Est et al., "Information Systems for Urban and Regional Planning" [Paper presented at the SORSA-UNESCO Seminar on Information Systems for Subnational Development Planning, Visakhapatnam, India, 16-20 December 1985].

According to van Est and his associates, there are four classes of specific characteristics of a GIS, viz.:26/

(1) Spatial distribution of points and lines of polygons. Such a distribution may be analysed by means of analytical tools like nearest neighbourhood analysis, graph theory, or conventional correlation analysis.

(2) Spatial clustering of areas. The formation of such zoning systems may be based on conventional classification methods such as factor analysis.

(3) Identification of information fields. The analysis of such catchment areas may make use of gravity models, trend surface analysis, intervening opportunity models, and standard regression analysis.

(4) Spatial evolutionary processes. The analysis of time-dependent changes in geographical structures requires various kinds of time series analyses (e.g., Monte Carlo simulation or Markov chain analysis) or nonlinear dynamic models (e.g., bifurcation analysis or catastrophe theory).

Furthermore, the design and use of a GIS requires familiarity with cartographic techniques. There is a wide diversity of maps to be used in a spatially-oriented information system, such as land parcel maps, planimetric maps, topographic maps, and reference maps.

Altogether, it is clear that a GIS is by definition much richer in scope and content than a standard information system, as it represents an integration of a topographic map and data files, while for computerized use, this map is usually converted into a digital file which can be read and used by the computer. There are numerous applications of a GIS for urban and regional planning, for instance, sewerage systems, health care, public transport, school services, urban renewal, housing, police and fire brigade services, parking systems, employment, route planning, and accident registration.

The foregoing remarks have also indicated that handling a GIS requires specific training, not only in terms of computer science, but also in terms of data collection, analytical techniques, and cartography. Thus, education, training, and practical experience are of paramount importance. Casley and Lurey rightly emphasize the need for training all surveying and enumerating personnel.27/ In this respect, a profound knowledge of the project (or plan) objectives at hand will enhance involvement of surveyors, and hence improve data quality.

On the other hand, planners and decision makers also have to have a basic insight into survey design, data collection, and information transmission and use (including data analysis methods). Thus the design, implementation, and use of a GIS has to be accompanied by training courses for all actors involved.

An instance of a course in GIS design, implementation, and maintenance is the one given at the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede. This twelve-month graduate course is meant to enable participants to: establish or improve a cadastral system; create or develop a municipal information management system; expand an existing cadastral system into a multipurpose land information system; and finally to establish a geo-information system for various levels of development planning and monitoring. The structure of the course is reflected in the following major subjects:

(1) Preparatory subjects: because of the varying background of participants, some attention is given to remove deficiencies in previous knowledge.

(2) Introduction.

(3) Discussion of the problem area.

(4) Environmental factors: political, legal and judicial, cultural, socioeconomic, technological, and institutional dimensions of the system environment.

(5) Information requirements in the problem area.

(6) Data required to derive information.

(7) Technology and data and information processing techniques.

(8) Resources required: human, financial, and equipment.

(9) Overview of existing cadastre or land information systems.

(10) Application to practical problems.

(11) Case studies.

(12) Final project: integration of all course aspects in a land information system project.

Such training courses which are specifically oriented towards the needs of developing countries in the field of GIS are scarce.

A specific way of providing input data for a GIS is remote sensing (especially aerial photography and LANDSAT MSS imagery). The main purpose of a training course should be to educate participants in the basic principles of photo interpretation, photogrammetry, computer cartography, or image processing. Activities involved are, inter alia:

(1) Photogrammetric techniques (e.g., computation of photo scales),

(2) interpretation techniques (e.g., detection and identification of objects),

(3) orbital data techniques (e.g., image interpretation), and

(4) digital image analysis techniques (e.g., dynamic spectral analysis).

In conclusion, a qualified informatics staff is necessary for making a GIS successful.

Having discussed some major features of a GIS and its training needs, it may be meaningful to take a look at the actual use of a GIS in various countries, in order to find out the strong and weak points of such a GIS on which basis one may draw some more general lessons for designing and using a GIS.

In this context, Appendix 1 contains a sample of GISs from various countries in the developing world. Clearly, a GIS is in principle multipurpose, but in practice a GIS usually serves a single purpose (for instance, energy, housing, or agricultural planning). In Appendix 1, the following classes of features have been used for systematic cross-national comparisons of GISs:

(1) Data collection and processing. This implies that due attention will be given to:

  (a) nature of data (definitions, spatial scale, class, and level of aggregation),

  (b) method of geocoding (e.g., choice of basic spatial units),

  (c) data collection techniques (e.g., surveys, censuses, and remote sensing),

  (d) quality of data (e.g., level of measurement), and

  (e) analytical tools (e.g., statistical procedures and spatial analysis methods).

(2) Information technology. In this respect, much attention is needed for the use of:

  (a) specific hardware (e.g., micros versus mainframe computer systems and use of digitizers),

  (b) software (e.g., specific programme languages),

  (c) graphics and data base structures (for instance, raster and vector based structures), and

  (d) interfacing (e.g., statistical, image processing, and thematic mapping packages).

(3) Maintenance and use. Here the question is: How often does maintenance occur and who is responsible? A sufficient technical infrastructure is needed, supported by a well-trained staff.

(4) Prospects and potentials. In this respect, questions arise concerning versatility and adaptability of a GIS.

Further details on GIS applications can be found in Appendix 1. Here we will only briefly report on some general conclusions.

In general, GIS uses in development planning tend to gain importance. Viewing the rising complexity of developing societies and the increasing integration of sectors, regions, and cities in socioeconomic and physical processes, there is evidently a need for structured, detailed, and geo-referenced information in order to adequately monitor and manage the dynamics of land and society. GIS is a new technology, and it will take time, money, and skills to apply it properly. Nevertheless, considering the powerful tool GIS promises to be, it is worth thinking about appropriate ways of implementing such systems in third world countries.

In this context, GIS should be multipurpose and versatile. Human and financial resources are scarce in developing countries, and a system that can be adapted to a range of different planning issues definitely has advantages in such a situation. Fixed costs are held low and the few sufficiently skilled persons available are efficiently utilized. Furthermore, by using one system for many data processing and analysis activities, an integrated approach to information analysis is facilitated. Partial or sectoral information systems, apart from cost considerations, are less suited for such a task.

In order to procure useful information, a GIS needs a solid data base. When implementing a GIS, it is first necessary to take stock of existing data sources relevant to the problem area or region. Further, an inventory of (potential) users of information, existing information flows, and decision making processes will be made to assess data and information needs. Combining these two dimensions in a bottleneck analysis gives insight into gaps in the data base. A GIS will have to draw upon a range of different data sources to facilitate integrated analysis and cross-checking of data reliability. All relevant administrative data files have to be collected, whether spatially oriented or not.

Next to existing statistics, a GIS should be capable of integrating and analysing output from remote sensing systems. Spaceborn image data might serve as basic information for regional analysis, with uniform scales and formats, and a complete and frequent covering of most areas. Airphotos or other, less conventional remote sensing material might provide additional information (in case of town planning, however, airphotos will constitute the basic information). Furthermore, correlation analysis based on remote sensing material and low resolution data might reveal the existence of physical surrogates for socioeconomic data and facilitate the filling up of gaps in the data base. Another advantage of such a uniform reference data set is the possibility to calibrate data of various scales and formats to a common base. In addition, a GIS should possess the flexibility to execute special problem-oriented surveys and to integrate these detailed data generated in this way.

Data have to be processed to become valuable for planners and decision makers. A GIS should have a wide array of storage, retrieval, classification, and analysis facilities to enable easy access to, and full utilization of, available information. Principally, the system should provide facilities in order to analyse geocoded and nongeocoded data statistically, spatially, and temporally, whether by internal programme modules or by interfacing with existing statistical, mathematical, and modeling packages.

Analysis techniques should also cater for informal, qualitative information. Modeling techniques have to be in line with data quality. In particular, monitoring and simulation facilities are needed. A GIS therefore has to be quick and flexible. New developments need to be recognized quickly, and the users must have the possibility to change model parameters easily.

Clearly, a GIS has to be embedded in the existing organizational structure. It is most suitable to conceive of a special agency with far-reaching competence. This GIS agency organizes data and information supply and is responsible for the communication between users and surveyors of data. To avoid unnecessary disturbance of existing organizational structures, representatives of relevant authorities should participate in this agency.

An information system for development planning should have a decentralized character. Development planning is primarily carried out at the urban and regional level, and a sufficient supply of information is most needed there. The information content of data generally rises when collection, input, and analysis of data are carried out at the same level, as the degree of involvement with urban or regional development of data collectors and suppliers is high in such a case. Thus, important informal information about attitudes, preferences, and nonquantifiable decisions, that otherwise might be neglected, has a larger chance to reach the decision makers.

CONCLUSION AND RECOMMENDATION

To ensure continuity and updating of urban or regional information systems in the long run, sufficient support has to be given in various respects. The absence of one or more support structures will easily erode the effect of those already set up and lead to a gradual degradation of the system. Unfortunately, it happens too often that sophisticated projects are set up that lack post-establishment support. In general, due regard has to be given to the carrying capacity of the receiving community first, before introducing new techniques. Technical, financial, and educational support structures are needed for the undisturbed functioning of an information system.

Proper maintenance and updating of existing hardware and software are the first prerequisite. New releases of information systems have to be installed by the supplier. A maintenance contract is advisable, with clear and narrow prescribed tasks. Some persons whether within or outside the organization must be at hand to adapt information systems modules to changing requirements, if necessary. To cater for hardware breakdowns, technical support (by employees of the informatics agency or by specialized service enterprises or organizations) has to be available. Furthermore, the data base has to be maintained, and old but useful data series archived.

Available funds are often the key for success or failure of a new information system. Therefore, stable, long-run, and sufficient finances have to be taken care of. Frequently the political will exists to furnish money for the establishment of a new information system, but after initial costs, it has to be realized that the continuation of activities and adoption and extension of programmes demand money too. Frequently this is overlooked after the first implementation decision. Political preferences and policy priorities may change, however, so that necessary updating may be postponed or omitted.

A self-supporting educational system has to be realized. Users of information systems output must be enabled to learn about information processing potential. Furthermore, they must be trained to fully utilize information output and to provide feedback to operators, analysts, and surveyors. After initial training they have to be retrained to accommodate to new developments. At least one person from the agency needs a more thorough training in high-level programming and computer architecture, to be able to meet small system breakdowns. Besides, national level central agency personnel might be educated in other high-tech skills for less frequent, but more complex tasks. Surveying personnel need sufficient training in data collection techniques to enhance data quality. While consumers of information will more and more become producers of data themselves (the "prosumer" approach), they also need thorough training in various data collection techniques. In all cases trainers have to be trained to induce multiplier effects and reduce dependency.

Summarizing, it might be concluded that finances and skills are the most limiting factors in the development and establishment of information systems, and that therefore one has to centre around issues of low costs and simple, but powerful, technology.

Informatics will profoundly alter our ways of living, working, and decision making in the immediate future. Public policy at national, regional, and local levels should not neglect these developments, but should give high priority to exploiting the potential of informatics (including telematics and telecommunication) in order to improve the quality of decision making, and hence, of life. Therefore, planning information systems should be developed that meet the organizational and institutional requirements of planning and policy agencies in cities, regions, and the nation as a whole. Particular attention may be paid here to computer-assisted decision making, geographical information systems, computerized cartographic methods, use and scope of micro-based computer systems, and systems design. The range of applications of computer-based information systems is wide and diverse, and in local and regional policy problems, in particular, we observe an increasing use of computer models, data base systems, and monitoring systems. New developments (e.g., decision support systems and expert systems), however, have hardly been implemented in urban and regional planning practice.

In conclusion, modern information technology offers an enormous potential for effective and balanced urban and regional decision making, as it is both a very efficient way of storing and transforming data into a useful format and a meaningful vehicle for communication between experts, decision makers, and planners. Clearly, the implementation and use of advanced information systems has to be fully embedded in the administrative, institutional, and policy setting of a city or region, while due regard has to be given to permanent training and education of personnel involved.

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APPENDIX 1. A SAMPLE OF GIS APPLICATIONS IN DEVELOPMENT PLANNING

The use of a GIS in spatial planning is a recent phenomenon. The continuous release, adaptation, and vanishing of geo-based information systems illustrates the unsatisfactory state of the field. State of the art overviews, like in the Handbook by the Commission on Geographical Data Sensing and Processing of the International Geographical Union (IGU), are already outdated. Many of the systems described in the Handbook no longer exist. The lack of coordination and standardization and the often completely incompatible and inflexible systems architecture saliently indicate the long way to go to maturity.

This holds true in developing country applications. Coherent and integrated spatial planning is rare, and systematic use of information in computerized systems is uncommon. In the few cases registered, the GIS has usually a limited domain and is implemented and maintained in the framework of a development project led by expatriate experts. This appendix will therefore analyse a few of the scarce examples of GIS utilization in a third world context. It is mainly based on the work of De Jong.

ENERGY ASSESSMENT PROJECT, WEST JAVA: THE SALADIN SYSTEM

The international oil crisis of 1973 brought the awareness that supply of cheap and sufficient energy is by no means self-evident, but a problem of international proportions. In particular oil importing developing countries faced tremendous difficulties in paying for their energy needs. But even oil producing and exporting countries like Indonesia, pressed by balance of payments deficits and a growing domestic oil consumption, need to pay attention to the national energy situation. Apart from a growing domestic oil consumption, the demand and supply of fuelwood (the main energy carrier for a large part of the population) constitutes a primary problem. Especially on densely populated Java, forest deterioration and concommitant land degradation and erosion are negative consequences of the extremely high fuelwood demand. Growth and development cannot be stimulated without a sufficient and balanced energy supply.

These considerations were the starting point of an energy assessment project in West Java. The project is part of an energy cooperation programme agreed upon by the Governments of Indonesia and the Netherlands. The main objects of the project were:

(1) to investigate the most feasible economic and technical ways of developing nonoil energy resources; and

(2) to utilize nonoil energy resources for rural energy and electric power supply.

The energy assessment project was meant to draft master plans for regional and integrated energy systems on Java and Bali, attuned to local demand and supply factors. Dutch experts had to assess this project. The pilot study included collection, analysis, and evaluation of data and energy modeling in order to develop an energy planning information system. To support these processes it was decided to utilize a computerized information system. Among various alternatives the SALADIN system (developed by the Research Centre for Urban and Regional Planning of TNO, Delft, the Netherlands) appeared to meet the project requirements best.

Data Collection Processing

The abovementioned project objectives were to be achieved through the following activities:

(1) Examination of energy situations in the selected regions.

(2) Examination of the possibilities to develop renewable and other nonoil energy resources.

(3) Identification of reasonable options, suited to present demands.

(4) Preparation of integrated energy development programmes, which might include the development of related energy information systems.

Such energy planning requires data on energy production, conversion options, and demand on a locational basis. Furthermore, it is necessary to gather information on the general physical structure of the area, both as a framework for spatial analysis and to identify physical barriers to the development of certain energy options. To gain insight into sociocultural objections to various conversion options, a social survey was carried out, that also served to take stock of potential but not yet existing energy demand.

In order to structure data collection and representation, firstly, three catalogues were compiled: a technical energy options catalogue, a biomass energy options catalogue, and an area catalogue, representing energy demand and supply, referenced to location.

Collected data and derived information were visualized on thematic maps, giving as good as possible spatial detail on demand, supply, and potential energy alternatives. Physical, financial, economic, and social barriers were identified, alternatives evaluated, and the most feasible options described, incorporating trends in energy demand and supply.

Important data for this energy assessment project, like those on energy supply and demand, are mainly compiled through the existing administrative structures, not always renowned for their accuracy. It is advisable therefore, to make not only a cross-check with other files, but also to check the existing data files with consciously executed sample surveys, especially designed for the project.

Information Technology

Storage, retrieval, manipulation, and presentation of many different data of this project are efficiently executed by a computerized information system. Energy planning deals with spatial data; so it follows that a spatial or geo-information system is required.

In Indonesia, a general survey of readily available computer and display facilities was made at the departments involved in the project. At the same time in the Netherlands, an investigation was carried out into the availability of mapping software, related management information systems, and hardware requirements from various institutions and enterprises. The SALADIN spatial information system was selected.

The computer configuration for SALADIN implementation in the energy assessment project consisted of the following hardware components: IBM-PC XT with 256 KB RAM, hard disk and floppy disk drive, mathematical coprocessor, and a colour graphics monitor. Peripherals are a Graphbar digitizer and IDS-PRISM 132 colour graphics plotter. The system runs under CP/M operating system and uses GSX for graphical applications. The programming language is Fortran from Supersoft. To ensure stable power supply, a rare condition in Indonesia, a voltage stabilizer was required. To avoid problems in hardware functioning due to temperature fluctuations, an air-conditioned location was preferred.

SALADIN uses vector data structures. It is based on the double-sided segment method, schematically representing the spatial infrastructure of the region by points, lines, and areas. Absolute location is referred to by coordinates. Every point (node) has coordinates. A segment is a straight line between two nodes; an area or zone is a closed sequence of segments; adjacent areas use the same segment, but different sides. All data can be linked to points, segments, or zones.

SALADIN software can perform various data manipulation procedures. Facilities in the energy project were: digitizing of maps; checking of a geographic base file; entering of administrative data; and the presentation of results in tables or thematic maps. Although the use of satellited images was considered in the project, SALADIN is not capable of directly communicating with digital remote sensing data. Manual interpretation on overlay maps, geometric coordination, and digitizing has to be carried out first.

Maintenance and Use

One of the reasons for choosing SALADIN was the adequate technical and educational support offered. Apart from training on the spot in GIS use, some project participants had the opportunity for extended training in the Netherlands. Breakdowns of the system will be catered for by expatriate experts and a well-trained counterpart, so that regular maintenance is guaranteed. Besides, IBM-PC micros offer an international standard in hardware, compatibility with many other machines, wide availability of applications software, and an extensive service network.

To increase the positive effects of energy planning implementation, due attention was also given to the organizational framework. Counterparts from all governmental departments and organizations involved were integrated in the project. Up to now expatriate experts were the driving force behind the project organization, but when sufficient regard is given to training and conversion of know-how in forthcoming project phases, a higher degree of self-reliance is to be expected.

Prospects and Potentials

Energy planning is only one application the SALADIN system is capable of supporting. Experiences in other fields in the Netherlands have shown its flexibility and adaptability. Nevertheless, as a vector based system it has its limitations. It is designed principally to work with physical infrastructure as a geographic base file, i.e., the street network as its basic spatial infrastructure. All information can then be linked to streets (segments), nodes, or blocks. At the level of town planning it usually functions very well. In Indonesia, given the regional level of planning, another basic spatial structure was sought. Land use was chosen as a delineator. However, other planning applications may demand other structures. Soil type, bedrock formation, soil depth, rainfall, and other natural resource or physical phenomena rarely coincide with predefined land use boundaries. Besides, monitoring changes of land use is evidently a problem in such a system. The development of several geographic base files and modules for polygon overlay processing is the answer to these situations.

AN APPLICATION OF MAP ANALYSIS PACKAGE (MAP) IN LAND USE EVALUATION

Land use evaluation serves to draw inferences on the suitability of areas for various land use types. In doing so, information is needed about a range of factors, e.g., natural environmental factors, such climate and areal characteristics as soil types, slope, groundwater, or vegetation.

Combination and manipulation of this information may lead to land quality assessment. Further analysis of land qualities gives insight into land use type suitability. Usually the most limiting land quality determines the ultimate land use type suitability. A land use evaluation therefore represents thematic natural resource data on a spatial basis. Overlays of maps are the most suited tools, together with site-bounded statistical exercises. Carried out manually, these procedures are very time consuming and costly, while errors are likely to occur.

A part of Kissi district, southwest Kenya, served as a pilot area to test the capability of MAP, a computerized GIS on a raster basis, for regional environmental planning. Kissi district was chosen because detailed data on land and environmental conditions were available. The district served as a study area for education and research for the Agricultural University of Wageningen, the Netherlands, during a period of eight years. The pilot area was selected because of the variety in soil types and topography, which made it suitable for a representative test. Next to developing an actual land use suitability map, the study intended to carry out scenario analyses in order to test the influence of present land use for further suitabilities.

Data Collection and Processing

Data needed for land evaluation were extracted inter alia from a topographic map (1:50,000) and airphotos (1:12,500). They concerned soil types, soil depth, stoniness, rockiness, topography, and various soil characteristics. In addition, data on climate, the chemical state of soil profiles, land use, and cultivation practices were available. As MAP is a raster system, all data had to be digitized and included in grid cells of 62.5 by 62.5 m.

The programme possesses a range of spatial analysis features, ranging from the analysis of soil and slope characteristics to the construction of a maze suitability map.

The second application of computerized processing of Kisii district data was a scenario analysis of changing land use type suitability under certain predefined conditions. The underlying assumption to carry out such a simulation of the future environmental state is that certain land use types might be detrimental to the quality of land in the long run.

To study the erosion processes over a number of years, it was decided to use empirical models that could be linked to available data sets. Two suitable models were chosen, and new analyses were made to calculate the effect of permanent maize cultivation on erosion. And vice versa, the consequences of erosion for land characteristics, land qualities, and ultimately land suitability for maze for each grid cell were assessed.

In general, MAP proved to be highly suitable for the task of determining land use type suitability. To cope with erosion modeling, an extension of the software had to be written.

Information Technology

At present, MAP is mainly implemented on minicomputers. The study described used field survey data, but data processing was carried out in the Netherlands on a MV/10000 supermini from Data General, installed at the Computer Centre of the State University of Utrecht.

Rising computing power and central memory capacity of micros in recent years potentially enable the implementation of MAP on a Personal Computer. MAP is thought of as a powerful and still simple tool for spatial analysis on such micros. Without much difficulty it is possible to convert the programme written in FORTRAN into independently usable modules that can be loaded on any 128 or 256 KB micro central memory.

Other hardware requirements are few. A digitizer is not needed, but may be helpful. Present geocoded data can be included manually, using run-length codes for easy data handling and administration. A graphics monitor is not prescribed, but might give better visualized pictures. The programme is interactive, but not menu oriented.

MAP is a raster system. The cell size and the number of overlays depend on the user's choice and the limitations of the computer memory and processing unit. The spatial analysis facilities of MAP are based on the concept of a map algebra. To command the operations, keywords are used that serve to identify an algorithm, resulting in a particular sort of transformation of one or more data sets. The action can be controlled by modifying appropriate words or phrases. In the data base each attribute is described by a separate raster overlay.

Maintenance and Use

Comments on this topic can be very short. No MAP packages are installed on computers in the developing countries, as far as is known now. The Kisii district environmental planning study used data from Kenya, but they were processed in the Netherlands. As mentioned above, probably MAP will be implemented in IBM-PCs. Maintenance of an international standard machine will give few problems. Furthermore, the other MAP hardware requirements are extremely modest, supporting a developing country application.

The programme is FORTRAN-written, using simple array data structures, relatively easily maintained and extended if necessary. The data manipulation operations are functionally dependent, well defined and for general purposes, accommodating a quick understanding of spatial analysis facilities.

Prospects and Potentials

MAP is a powerful raster based GIS, using the latest ideas in raster data processing. It might be applied in many kinds of rural and regional planning. The present utilization was land suitability evaluation, but other kinds of natural resource and environmental planning may also benefit from such a planning tool.

MONITORING OF LAND USE CHANGES IN MONERAGALA, SRI LANKA

Moneragala is a district in southeast Sri Lanka. It is one of the least developed and least populated areas, but also one in which developments take place rapidly. These developments bring about drastic (planned or unplanned) changes in land use patterns. To control such developments, integrated change monitoring and land use planning is badly needed. For timely and proper planning, reliable data are a prerequisite, and one method to supply such data is interpretation of remote sensing images.

In Moneragala district, two case topics were of main interest: land use inventory and change analysis. In three successive years (1982-84), several teams of course participants from the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, the Netherlands have carried out remote sensing survey projects, including fieldwork in parts of the district in order to provide a basic dataset to enable such inventory and analysis. Ultimately, the data and derived information would serve as a base for an integrated rural development plan. By comparing past and present land use patterns, some insight may be gained into the processes behind the development of such patterns. Comparison and analysis of these large and complex datasets was facilitated by the use of a raster based geographic information system, USEMAP, developed at ITC.

Data Collection and Processing

To fulfill the information needs of integrated rural planning, data were collected from airphotos and LANDSAT-MSS images. For the study area, airphotos in 1956 and 1982 were available, next to some isolated strips of airphotos in 1970, 1972, and 1975, that only cover small parts of the district. Furthermore, LANDSAT images in 1976, 1978, and 1980 provided information.

At first, an inventory of the present land use and vegetation cover was made by interpreting the 1982 airphotos and 1980 LANDSAT images. Secondly, the 1956 airphotos were interpreted and analysed. The pictures in 1970, 1972, and 1975 provided scattered information only, and were combined into one new land use map, thus reducing the time span between the two full inventories.

Airphoto interpretation appeared to be far from easy for an area such as Moneragala district. Some categories of land use, such as forest, water, and large paddy complexes can relatively easily be delineated and identified, but various large areas appear to have complex land use patterns, like dispersed land settlements amidst homestead gardens and areas with interspersed cultivation. While the basic spatial unit used in computerized data processing was 1 ha, it would be meaningless to delineate these land use types exactly. Complex categories were used instead.

It can be imagined, therefore, that satellite image interpretation posed even more interpretation problems, taking into account the course resolution. Detailed inventory from such images is out of the question, but related to photo-interpretation and field observations, they proved to be very well suited for monitoring activities. LANDSAT satellites scan an area at regular intervals (eighteen days), so even when atmospheric conditions interfere, the chance to obtain a useful series of images is much larger than that of obtaining a series of conventional aerial photographs. The results of all these inventories were compiled into a series of maps. Change analysis was carried out by comparing these maps.

To enable computerized comparison, the various maps were digitized, first semiautomatically (using a digitizer table to include the map polygons into a vector data base) and later on by rastering the polygons through a conversion programme.

Information Technology

Results of the Moneragala district survey were processed using USEMAP software. USEMAP is a programme developed by ITC's Urban Survey and Human Settlements Analysis Department to process and analyse data from airphoto interpretation, and to construct a common data base for airphoto and other spatial data.

At ITC, where the data were processed, the USEMAP hardware configuration consists of VAX 11/780 mainframe or alternatively a PDP 11/24 mini, three Tektronix graphic terminals, one AED colour graphics terminal, various digitizers, a Hewlett Packard pen plotter, a Trilog colour printer, and several VT terminals.

USEMAP is a raster GIS, with a conversion module to transform vector digitized data to raster mode. Usually, base maps interpreted from airphotos or existing maps updated with aerial survey techniques, are included with a digitizer tablet. Other modules enable map editing and layout, (selective) retrieval of stored data, integration of overlay maps, and improvement of proper output maps. Besides, some spatial topographical analyses are feasible, e.g., catchment area analysis with a spread of function. USEMAP is regularly adapted and developed to meet new demands that are feasible within the constraints of the main programme structure.

USEMAP is linked to GIMMS thematic mapping software (vector based) to enable more flexible input and output and a wider range of map representation possibilities. Interfacing with some statistical packages is possible too.

Maintenance and Use

The present use does not involve a USEMAP implementation in Sri Lanka. The system is supported in India, however, at the Indian Institute of Remote Sensing (IIRS), where with the help of ITC's Urban Survey Section, a Human Settlements Department was set up. Part of this cooperation involves the training and maintenance of a USEMAP geographic information system, be it in a slightly simpler configuration. Indian planners are trained in GIS use, within the Human Settlements regular course at IIRS. Besides, some technical and operating personnel had the opportunity to receive a more thorough education in USEMAP maintenance at ITC, to initially start up a local technical support structure.

General computer support is given by specialized personnel from IIRS. Specific USEMAP performance problems will be taken care of by ITC consultants. Training courses in USEMAP application in planning are given at ITC every year, as a part of the Urban Survey graduate course. These programmes are specifically adapted to developing country situations and planners from these regions.

Prospects and Potentials

While USEMAP is developed by and for an urban survey department, the grid cell approach adopted makes it even more suited for regional planning purposes, as shown by the present example. Updating and adaptation of the system makes it flexible enough for various planning applications. In combination with GIMMS thematic mapping package, its output and statistical facilities are largely extended. The programme still performs relatively well, even compared to other, newer systems. The field of its original use, urban planning, might however be served more by a larger emphasis on physical infrastructure representation. A specific vector system may then probably perform better.

LANDSCAPE ECOLOGICAL PLANNING AND IMAGE PROCESSING GIS

One of the reasons for the failure of many development projects is the lack of a long-term and integrated view on the consequences of planning decisions. Environmental impacts and the consequences for future generations of present planning decisions are frequently neglected.

Recently, more emphasis has been given to the need to develop a holistic framework for planning by integrating physical, biotic, as well as socioeconomic and political factors of development. This new approach to development planning is coined as landscape ecological planning.

Landscape ecological planning is defined as a continuous process of influencing and monitoring the changes in land use, and is used for the formulation of strategies and programmes for man's action on the landscape in order to arrive at an ecologically sustainable development situation.

In the framework of a research project by ITC, a study was carried out to contribute to the development of landscape ecological planning in developing countries. The research area was located in the Llanos Orientales, East Colombia, an area characterized by a savanna landscape, and one of the most densely populated areas of the Andean frontier, with a high rate of in-migration from the bordering mountainous regions. Livestock production is the most widespread form of land use in the area. Interpretation of airphotos and other remote sensing images, together with socioeconomic surveys, provided the material for this study. Thematic maps compiled with this information were stored and processed in a computerized GIS to facilitate analysis.

Data Collection and Processing

The aim of the study was to establish a land use development model at reconnaissance level for a part of the Llanos Orientales, based on the landscape ecological planning approach as an input to regional development planning. Several research activities were carried out to design this land use development model. At first a landscape survey was made to describe physical and human characteristics of the landscape. Data were collected on soils, climate, vegetation and fauna, population, settlements, social and physical infrastructure, farming systems, and land use. Tools for this survey were interpretation of airphotos and LANDSAT imagery, secondary sources, and a primary survey.

It was possible to construct various maps from this material for further analysis. Landscape, land use, and farming system maps were produced, as well as maps on settlements and infrastructure and on population density and distribution. The time series of available material enabled longitudinal analysis.

The second step was labeled landscape evaluation. It included a description of physical and socioeconomic characteristics of various farming systems, a determination of land suitability classes, and an assessment of the feasibility of various land use types in the light of socioeconomic and physical constraints. For this purpose, information from the first step was combined with specific information on several alternative farming systems and other land uses. Factors included were: suitability of the land, generated employment, level of technology, land tenure system, and minimum income required to maintain the system.

In the first step, impact analyses were made to assess the consequences of implementing different farming systems in the long run, taking into account both physical and economic performance and trends in population growth. After evaluation, a choice was made for four planning model alternatives, based on different combinations of agricultural and ranching land use systems for different landscape zones. Impact and evaluation analyses were executed on a GIS that produced planning maps, tables, and graphs to underpin further formulation of development policies.

Information Technology

The present GIS is developed by the Image Processing Laboratory (IPL) of ITC. It is based on image processing software (Ramtek) and adapted to map analysis and production. It runs on a PDP 11/44 mini (1Mb RAM) and uses an array processor (AP 120B, 16 KB) to facilitate manipulation of large matrices, usual in image processing. Peripherals are a Ramtek colour graphics terminal, a Symmagraphics digitizer, and a Gould electrostatic printer/plotter. Besides, an Optronics colour film writer is available to enable production of hardcopies from the videoscreen. It is a rather advanced and expensive system, caused by the fact that the hardware is normally used as a dedicated image processing environment. The IPL-GIS is still in a rather premature phase. The present study was the first real planning exercise executed on it, and experiences from this study will be used for further improvement. A major advantage of using an image processing system like this one, is that it allows for very refined grid cells. The system is designed to work on large LANDSAT frames, encompassing a very large number of picture elements. Thus, it solves some of the disadvantages of raster systems concerning an accurate representation of physical reality. A large computer internal memory and special processing facilities are inevitable, however, to run this GIS.

The IPL-GIS is designed to avoid some of the disadvantages of existing GIS, like cumbersome digitizing of input data and inaccurate representation of reality in raster systems. Principally, it uses two base files: a polygon file that encompasses area class and attribute information. Besides, it is possible to define overlay data, such as lines of physical infrastructure, symbols representing point data, and text. Vector and point data are included via a digitizer tablet. A graphics conversion module takes care of the transformation to picture elements.

The IPL-GIS is very user friendly. It can be managed interactively and is menu oriented.

Maintenance and Use

The IPL-GIS is only used at ITC, at the moment. Operationality still has to be improved. Its use is very simple, one or two days of exercise and some background knowledge of spatial data manipulation suffice to use it in day-to-day planning practice. For those who intend to get a more thorough knowledge of GIS and image processing, graduate courses are offered by ITC. At present technical and educational support is given by the Image Processing Laboratory, as the system is only implemented over there.

Prospects and Potentials

As remarked, the system is still under development, in hardware as well as in software aspects. Its aim is to strengthen analytical capabilities. At the moment, the IPL-GIS does not answer much more than simple combinational queries. More complex mathematical, logical, and statistical analyses are foreseen in the near future.

Conversion from PDP 11/44 to IBM PC is under way. ITC is involved in regional planning consultancy projects in the Moluccas and South Sumatra, Indonesia. The IPL-GIS on IBM micros will be applied there. Special attention is paid in these projects to integrate data derived from remote sensing imagery (especially airphotos) with administrative data files and survey data into one spatial-oriented data base for planning.

"CRIES" LAND RESOURCES ASSESSMENT PROJECT

To adequately compare and analyse the characteristics of different land use options for different areas, computerized data processing and modeling is very helpful. The comprehensive resource inventory and evaluation system (CRIES) intends to facilitate such integrated analysis.

The CRIES project was initiated in 1976, with joint funding and participation of the U.S. Agency for International Development (USAID), the U.S. Department of Agriculture (USDA), and Michigan State University. It uses a multidisciplinary approach to assist developing nations in the analysis of agricultural production potential, and rural land use policy design. Technical assistance is provided in the field of:

(1) resource inventory design and implementation;

(2) comprehensive resource data base development, information management, and analysis;

(3) analysis of policy alternatives and policy design; and

(4) technology transfer and training.

CRIES information system consists of two independent but related information systems. The geographic information system (CRIES-GIS) is developed to capture, store, retrieve, and analyse georeferenced data. The agro-economic information system (CRIES-AIS) is designed to provide management capabilities for general agricultural and economic data essential for determining production potential in terms of crop yield ranges or economic revenues generated. Analytical routines of the latter system are linked to the geodata base.

Since its initiation, CRIES has been applied in a number of Central American and Caribbean countries. Typically the project tries to accommodate existing institutional structures, data bases, and technical capabilities. Remote sensing data collection techniques constitute a major primary data source.

Data Collection and Processing

A typical CRIES approach uses a reconnaissance level survey first, to delineate agro-ecological zones grossly. Existing information on soils, climate, and vegetation is utilized, while field surveys serve to further refine secondary data, zone characteristics, and boundaries. Remote sensing data collecting techniques, from LANDSAT image interpretation down to low-flying, small-format-camera airphoto systems, are frequently utilized as quick, cheap, and still very informative primary data supply systems. The type and detail of available secondary data, project aims, and cost considerations determine the level of detail possible in discerning different zones.

These agro-ecological zones are labeled resource planning units (RPU). In further data collection and analysis steps these RPUs are related to present land uses and associated farming systems, farm management practices, feasible land use alternatives, and their associated estimated production potential. The latter are calculated from results of crop experiments and selected field trials, drawing upon models including crop requirements, water balance, and yield estimation. The RPUs are then ranked to crop production potential for a single commodity or commodity group, given a defined input mix and volume, adjusted for local farm management practices. Relative performance is expressed in crop yields or economic terms.

The first evaluation of comparative production potential is then further adjusted. Realistic production levels have to be assessed, which can be sustained by the resource basis over a long time period, without depleting or negatively affecting its production capacity for future generations. Therefore, factors like erosion susceptibility and nutrient depletion are included in the analysis, next to the simulation of various options of soil conservation practices.

Furthermore, to fully determine relative advantages of different land use types, commodity and capital market situations are taken into account. Demand for farm output or land resources differentiates among regions and for crop type and fluctuates in time. Insufficient supply of farm inputs can restrain production and/or cause soil depletion and land degradation in the long run.

Information Technology

The CRIES system has two main parts, GIS and AIS. CRIES-GIS consists of two major components: the geographic master file creator (GEOMAST) and the geographic resource analysis programme (GEORAP). GEOMAST provides the capability to store, edit, and process digital map data and creates the master data base used by GEORAP. GEORAP facilitates the input, retrieval, combination, overlay, modifying, and display of spatial data.

CRIES is implemented on IBM-PC XT (256 Kb), in combination with floppy disk drives, a digitizer tablet, and a dot-addressable colour matrix printer. CRIES-GIS allows for a data base of 9,999 rows by 9,999 columns and up to thirty attribute overlays, with attribute values ranging from 1-9,999. The analytical capabilities of GEORAP allow the user to perform descriptive statistics (frequency, cross tabulations), to delineate areas within a given distance from a grid cell, to produce overlay maps, to develop suitability indices, and to perform suitability analysis. The user can also develop a series of derivative maps for use in other analyses.

As described above, information from CRIES-AIS ultimately determines resource production potential for a certain RPU. Therefore, in essence, the linkage between GIS and AIS constitutes the CRIES approach to resource inventory and evaluation. AIS provides possibilities for statistical analysis (descriptive and inferential) and econometric and mathematical modeling. AIS modules include water balance models to trace the availability of soil moisture during the crop production cycle; yield estimation models to calculate crop yields in given agro-ecological zones; and economic rates of return for single or multiple farm output commodities (crops). Linear programming and input/output modules provide tools for economic analysis, for instance, to determine the best production mix for a region under certain resource constraints; or the impact of demand, investment, or production options on other parts of the economy.

The CRIES information system is menu-driven, and depends on computer facilities to be used in batch mode or interactively.

Maintenance and Use

CRIES implementation always depends on the current situation in the host country or region. Existing computer facilities and the extent of technical and problem-oriented skills available determine to a high degree the specific method of CRIES system installation. Besides, the degree of consulting support from the CRIES project team also depends on the availability of local trained and qualified personnel and project scope. The CRIES approach to maintenance and support is flexible, but in general it is aimed at reaching a high degree of self-reliance and self-support of the receiving community.

At present, the system is maintained on an IBM-PC, but the programme is installed on various levels of mainframe and minicomputers, and supported as such. The micro approach serves to provide a dedicated system option and a stable stand-alone data processing environment.

Care is taken to minimize additional training needs for the host institutions and to concentrate processing at available computer facilities. If needed, on-the-spot training courses in GIS use are organized.

Prospects and Potentials

To improve analytical capacities of the system, mathematical or economic models may be developed, or existing ones may be adapted for use in resource evaluation, dependent on user needs and project aims.

Interfacing with digital and analogue image processing will be improved in the near future. Ultimately, CRIES intends to become an integrated image processing/information processing environment on a microcomputer configuration. New system options for different problem areas might be feasible by developing new information system components, like AIS drawing upon CRIES-GIS for geodata.

EVALUATION OF THE FIVE GIS APPLICATIONS

GIS utilization in the developing countries is new and hardly operational. The five applications discussed above show that various countries are still in the phase of experimentation. In fact, only the SALADIN and CRIES systems are instances of integration in indigenous planning, and even these have not yet reached maturity. All others are research applications, though promising to be implemented in day-to-day planning practice more solidly in the future. Our short evaluation is therefore not meant to critically review present planning applications in the first place, but rather to analyse the various GIS components with regard to their suitability for development planning purposes.

Figure A.1 gives an overview of the main characteristics of the five GISs outlined in the previous subsections.

In figure A.2, a tentative evaluation analysis is carried out with respect to major components of these GISs based on various criteria:

(1) Applicability of the GIS concerned for the proposed planning objectives;

(2) integration of these GIS projects in indigenous organizational structures;

(3) concordance of used technology and necessary skills with respect to existing technical and human resources, or facilities to stimulate such;

(4) technical capacity of the system, i.e., adaptability, versatility, sophistication, and processing potential; and

(5) correspondence of data needs with collection potential.

From figure A.2, it is clear that there are some conflicting issues in a GIS evaluation. Ideally, a system is low cost, easy to handle, multipurpose, and powerful. However, the latter two features frequently conflict with the former two. Multipurposeness usually involves complex programme and data structures, because the system has to cater for datasets from various levels of spatial detail and different analytical techniques. SALADIN and IPL-GIS bear the features of this conflict. They are the most versatile systems, yet rather complex and not cheap. Of course, this does not say anything about user friendliness; both systems are menu driven. But maintenance and eventual adaptation of the programme remains difficult.

Another conflict might be observed in accuracy of representation of spatial reality and analytical capabilities. Raster systems have a high potential for powerful spatial analysis. Because each pixel can be independently referenced, overlay and contiguity techniques are very flexible. MAP provides a powerful example of a raster based system for all kinds of spatial analysis. However, it only allows for a relatively small data base, and pixel size has to be large when studying a region. Line and point elements are therefore not accurately represented. Furthermore, IPL-GIS offers another conflict situation. Though it is principally a raster system in representation, it forestalls many of the drawbacks of such systems by allowing for very fine grid cell sizes. However, to manage such large raster data bases, and to suit pixel-by-pixel analysis, internal memory and processor capacity has to be considerable.

Figure A.1. Major Components of the Five GISs Discussed

	SALADIN	MAP	USEMAP	CRIES	IPL-GIS
present use	energy programme	land suitability analysis	land use monitoring	resource assessment	landscape ecological planning
planning orientation	regional, integrated	regional land use	integrated rural development	spatial development planning	regional land use
nature of data	physical, socioeconomic	physical, cultivation	land use, land coverage	natural resources agro-economic	physical, socioeconomic, ecological
data collection techniques	administrative files, special surveys, secondary source	soil surveys, airphoto	airphoto LANDSAT	airphoto LANDSAT secondary source	LANDSAT field survey
analysis techniques	classification, evaluation energy-balance	classification logical overlay scenario	change-detection classification	land use feasibility modeling	land use ecological modeling
hardware	micro digitizer plotter	mini printer	mainframe digitizer printer	micro digitizer printer	mini digitizer printer
software	menu-oriented, vector	commando raster	commando raster	menu-oriented raster	menu-oriented raster/vector
maintenance	international service TNO	?	?	existing service CRIES-projects	?
training	TNO on-the-spot	? Dutch	ITC	on-the-spot CRIES-projects	?
Organization	planning boards	?	? IRD-boards	planning boards	?
other applications	urban, infrastructure planning	natural resource planning	urban planning	various	various

Figure A.2. Evaluation of GIS for Development Planning Suitability

	SALADIN	MAP	USEMAP	CRIES	IPL-GIS
feasibility for problem at hand	+	++	0	++	++
maintenance and technical support	++	?	+	++	?
training of users and technical personnel	+	?	?	+	?
organizational structure	++	?	?	+	?
data processing and analysis capacity	0	++	0	++	+
sophistication and growth potential	+	+	0	+	++
versatility and multipurposeness	+	+	0	0	+
hardware requirements	++	+	0	++	+
complexity of technology	0	++	+	+	0
accommodation for various data collection methods	0	+	0	+	+
costs and financial support structure	+	+	+	+	0

COMMENT

Ralph Gakenheimer

The rise of information technology in the developing world is surely as impactful as the author's originality of vocabulary suggests. Perhaps the greatest challenge is how to fit the hard- and software to the "orgware."

This is framed in the paper by the proposal that different activities will take place at the national, regional, and local levels. In regard to the definitions of the levels, I would have preferred the "national" level to be macro, i.e., the nation as a nonspatial whole including interactions with outside influences. Its definition in the paper inadequately distinguishes it from the regional level. I will nonetheless accept it as a given for these following comments.

Then, how do the three levels vary from one another? One of the major variations is simply the grain of the data (e.g., the size of spatial units in the demographic records). To the extent this is true, of course, the whole vertical system is best kept as a single unit. Then, there are other topics where a difference in grain becomes a difference in content. For example, regional land use is probably mostly resource based (like the examples the author uses) while local land use is parcel activity oriented. These are less usefully integrated.

Then, there is the issue of relations between the levels. In most countries, there is a good deal of concern at the national level for comparable regional data that permit analysis of locations of new productive investment and infrastructure, management of the regional equity issue, and so forth. Recent distinguished examples are the national urban policy plans of Indonesia and Egypt. This leads to an emphasis on national coverage of compatible economic and spatial data.

Planning within regions, on the other hand, is much more variable. Few developing countries have any consequential units of government at this level, though some have important corporate regional development enterprises (e.g., Venezuela and Brazil). Are these units to be considered independent development activities, or just elements of a national development administrative system? The answer is important to the information system.

The situation of local areas is the most difficult. Local governments over much of the developing world are quite weak, but have some chances for significant initiative, at least in major cities. It is very difficult to determine the situation of local governments briefly, because almost every country in the world professes a dedication to decentralization, but few do much about it. Is one purpose of a local information system to feed national policy functions with a flow of intelligence about the locality? Or should the national system on the contrary, be built to feed local planning? And just what functions go on at the local level: reasonable control over major capital investments, reasonably independent operations and maintenance activities, or reasonable control over administrative services? All such things are key to improving the information system.

The author provides very interesting discussion of land use information systems. Comparative analyses of this kind are very useful when matching capability with purpose. What will the land use information be for? Military mapping, cadastral records to increase tax revenue, upgrading and renewal plans for the cities, control of the extension of urbanization, demographic estimates in the absence of censuses, surveillance of building, natural resource inventory, and resource use survey. It cannot do everything and be kept up-to-date.

Finally, it is important to acknowledge that there will be many independent information systems. I have worked in Indonesia, and I am aware of at least a dozen urban and regional information systems there (excluding the one for West Java described by the author), and no doubt, many more still. Each needs to be positioned in the "orgware" relevantly to its purpose.

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THE THIRD COMPUTER REVOLUTION:

IMPLICATIONS FOR TRAINING IN DEVELOPING COUNTRIES

Marvin L. Manheim

OBJECTIVES

In this article, we will first review the nature of information systems (IS) technologies as they are emerging today in many countries. Then, we will examine the objectives of planning. This will lead us to a discussion of the objectives of IS organizations in developing countries. From these organizational objectives, we develop a statement of training objectives for IS professionals in urban and regional planning. Next, we outline the elements of a training programme which would be appropriate for achieving these objectives. The final section contains conclusions and recommendations.

EVOLUTION OF INFORMATION TECHNOLOGIES

The first era[1] of IS applications in business and planning was concerned with transaction processing: Processing large volumes of data in an efficient manner. This was the era in which large payroll, accounting, inventory, and order processing systems were built.

The second era was concerned with the development of Management Information Systems (MIS). Here the emphasis was on developing data useful for managers, through developing data bases containing operating data as well as transaction data, and through developing a variety of specialized reports for use by managers at various levels. The key limitation of this effort was its ambitiousness: Often, MIS were very large and attempted to be comprehensive, and required the skills of a large number of programmers to develop and maintain the system. The key liability was that it became very difficult for managers to get modifications to the system, e.g., to get new or somewhat changed reports, because of the system's size and complexity, and because only skilled programmers could work within it. Thus, when managers found they needed to add new types of data to a report, or obtain new types of reports or analyses, they were frustrated by the time delays and expenses involved in getting their needs met.

The Third Computer Revolution

We are now in a third era of computer support. In this era, the emphasis is on the concept of Decision Support Systems (DSS).2/ The objective of a DSS is to provide support to a particular set of decision needs of a manager or group of managers or department with a specialized IS. The software technology available for DSS today provides a rich variety of financial modeling, graphic, and statistical tools, with easy-to-learn languages, that allow either the user or his staff to develop and modify reports quickly. Often, DSS are implemented on minicomputers or microcomputers and so are decentralized organizationally as well as technically.

It is useful to look at this evolution as a revolution of service delivery concepts -- how information processing services are delivered to the user:

(1) In the transaction processing era, the IS staff were the developers and, in a sense, the users. IS was running a production line almost like any other production line in the organization. The primary objective was the production of the product (transactions) and the production of information for decision making was secondary to this objective.

(2) In the MIS era, the objective was to develop reports useful for users. So, elaborate programme design methodologies were developed, in which users were consulted as to what they thought they wanted in terms of information and reports, and the IS staff went off and designed, programmed, tested, and ran the MIS. As noted before, the users had only partial control over the process; system developers, constrained by staff and other resource limitations, and also by the complexity of any modifications to a large software system, were rarely able to respond to users in a timely manner.

(3) In the DSS era, a style is emerging which some have called "end-user computing" (EUC). In this style, the user runs the programmes himself to produce the reports he needs, and, more importantly, modifies the programmes himself to produce new reports and new graphic displays. In this activity, the user may be assisted by staff in a variety of ways:

    (a) they may assist in recommending hardware and software for a DSS;

    (b) they may offer training and technical assistance;

    (c) they may offer consulting services to do tasks requiring substantial technical expertise;

    (d) they may provide linkages to other computers and to company and external data bases, and perform other "utility" activities.

It is particularly important to note that the technical assistance provided by the IS staff may be assistance to the user in formulating his own needs, assessing alternative approaches, and implementing his own solution. In this last role, the IS staff are no longer the primary "doers," but are support staff to the user in "doing his own thing."

In fact, in some organizations, some of these functions are being performed not by central IS staff, but by technical staff hired into the end-user's own functional department -- for example, when a marketing department hires its own programmers to support marketing staff with personal computer and minicomputer applications using specialized data bases.

This broader role requires different skills than the traditional IS personnel typically have. This style of support to users requires the ability to relate well and easily to nontechnical professionals, to work with senior managers as well as clerical staff, to help understand users' poorly-articulated needs, to teach users effectively without talking down to them, and so forth. This requires new types of personnel in the IS functional area, as well as development of new skills for existing personnel.

To summarize this discussion, the key features of the "third era" of the computer revolution are these:

(A) The user controls the development and use of specific computer applications, not the programmer:

  (1) the user develops many applications himself;

  (2) the IS staff provides support to the user in many ways:

    (a) consultant assistance;

    (b) training;

    (c) system development -- software; and

    (d) system acquisition -- hardware, software, others.

(B) In many cases, user applications keep evolving; as the user gains confidence and experience with a particular application, he discovers new needs and formulates new aspirations about what expanded support he wants.

(C) The use of microcomputers dramatically expands the numbers of those who use computers:

  (a) the attributes of the microcomputer make it highly accessible to many people, especially the low cost (relatively speaking), ease of purchase due to wide availability, and ease of learning how to use the hardware and much of the applicable software.3/

  (b) the ease of use, personal access, and privacy of use foster development of a personal relationship to the use of the computer, rather than impersonal, and distant (as with large mainframes or even minicomputers) -- "my computer," "my data base," "my spreadsheet analysis."

(c) the microcomputer is especially effective in developing countries, because it provides a significant level of computing power at a modest cost, and rarely requires a specialized physical environment or support staff.

The implications of the third era is, in fact, a major revolution in computer support:

(1) The modern IS professional has the capability to offer many different products and services in support of end-users. (See table 1.)

TABLE 1. MAJOR INFORMATION TECHNOLOGY COMPONENTS

HARDWARE

- Computers
    - Mainframe, Mini, Micro, Laptop
    - Batch, Remote Job Entry, Interactive
    - Single Site, Multiple Sites
    - Stand-Alone, Dial-Up, Local Network, Distributed Processing
- Communications
    - Voice, Data, Mixed

DATA BASES

- Internal, External

SOFTWARE

- Prepackaged Applications (Accounting, Word Processing, Technical Models)
- Bounded Application Generators (Data Base, Spreadsheet)
- Evolutionary Application Generators

SERVICE DELIVERY MECHANISMS

- Information Processing Concepts Supported
    - Transaction Processing
    - Management Information Systems
    - Decision Support Systems
- User Support Provided
    - IS staff formulate specifications, develop software
    - User formulates specifications, IS develop software
    - User formulates and develops own software
        - With support of systems expertise
            - In IS department
            - In user department
        - Without support

(2) The user has become dominant: The user controls his own computing support, and does many things himself.

(3) As a result, the IS professional is coming more and more to focus on assisting users to use computers, and in many cases assisting them to grow significantly in their uses of computers. Further, as a consequence, the personal style of the IS professional is changing to become more entrepreneurial, and more catalytic in the organization.

THE OBJECTIVES OF PLANNING

Now, we turn to address the question of the objectives of planning organizations in developing countries. We will use the term "planning organization" for any agency or organization, public, semipublic, or private, involved in comprehensive or functional (e.g., transportation, housing) planning at the local, regional, or national scale.

The objectives of a planning organization are to stimulate and guide social and economic development, utilizing the various tools open to it. Historically, planning agencies have been heavily oriented to physical planning. More recently, emphasis has shifted in some instances to social and economic planning.

Two Major Roles

There are two major sets of objectives of planning agencies, which lead to two different views of the roles of the agency and its staff.

In general, the philosophy of planning is "top-down," although occasionally there is increasing emphasis on "bottom-up." In the top-down view of planning, the role of planning is seen as developing a comprehensive plan and adopting it for implementation. The development process typically involves collection and analysis of large quantities of data, in an attempt to be "comprehensive" and "systematic." The planning process typically takes several years and large manpower resources. The time frame of such planning is typically "long-range," with a focus on ten to twenty or more years in the future. Often, there is a translation of the plan into five-year and annual implementation programmes. The process of adopting the plan typically involves the planning agency taking certain decisions, which may or may not then be binding on implementing agencies.

There is an emerging view that the most effective approach for a planning organization is to see its role as "catalytic," or "bottom-up," rather than "top-down" or "directive." In this role, the organization focuses on stimulating actions by others to move in desired directions. "Self-help housing" is one example of this. Another example is the provision of financial, technical, and/or managerial assistance to farmers, small businessmen, or other entrepreneurs to enable them to develop their activities effectively.

This "bottom-up" approach is often in marked contrast to the "top-down" approach in several important ways. The top-down approach emphasizes a quantitative, impersonal, abstract approach to planning. Planning professionals deal primarily in a world of numbers and maps, are engaged in heavily technical analyses, use extensive large-scale computer processing of information, and are aloof from the political process. The objective is to develop a plan which is professionally sound and which is adopted at a high political level.

The bottom-up approach emphasizes a qualitative, people-oriented, and action-oriented approach to planning. Planning professionals deal primarily in direct human terms, working with individual farmers, businessmen, or other entrepreneurs. Their emphasis is action-oriented, for example, in overcoming bureaucratic obstacles or getting small projects implemented. The objective is to solve problems and get something implemented.

There is a correspondence between these models of planning and the evolution of information technology. The top-down model corresponds to the first and second generations of information technology: The transaction processing and MIS approaches involve large-scale computer systems, processing of large quantities of data, a heavily-technocratic and highly-trained staff, and significant distance between the technology and the user.

The bottom-up approach corresponds to the third era of information technology, that of user-dominated information support, or DSS.

OBJECTIVES OF INFORMATION SYSTEMS FUNCTIONS IN PLANNING ORGANIZATIONS IN DEVELOPING COUNTRIES

In our view, there are two major missions for the information systems functions in planning organizations in developing countries. These missions follow from the alternative roles of planning described above:

(1) provide support to the traditional planning activities, oriented to "top-down" planning;

(2) provide support to the role of the organization as a catalyst to social and economic development by exploiting the power of information technologies.

Support to Traditional Planning Activities

To support the traditional planning activities of an organization, the information systems function can do these things:

(1) provide technical tools, such as data, planning methods, and models, in a computer environment; here, the priority is to make sure that the tools are relevant and useful, and to work to get them used by the planning staff in the organization;

(2) develop and retain technical expertise in the areas of planning, planning methods, and computer support to planning;

(3) broaden the constituency for technical planning activities, and broaden the resource base available for information systems support, by building services offered to others around the capabilities developed in the process of doing planning — for example, provide data or data collection services, models or model development services, forecasts, research, and policy analyses for the organization itself and for outside clients, and information systems support for these products and services.4/

Support to a Catalytic Role in Development

To provide support to the "bottom-up," catalytic function of a planning organization, the organization can work to:

(1) stimulate development of better management practices in businesses and public enterprises;

(2) stimulate development of entrepreneurial attitudes and skills in personnel of planning and other agencies, organizations, and firms;

(3) stimulate development of specialized business activities, either in the public sector or in the private sector.

Thus, in our view, a primary objective of the information systems capabilities in a planning agency should be:

> The information systems capability of a planning agency should have a primary mission of stimulating social and economic development through use of information systems services and products to support external users, especially to support increases in the capabilities of external organizations.

OBJECTIVES FOR INFORMATION SYSTEMS ORGANIZATIONS

To provide support to the planning organization in accomplishing its "bottom-up," catalytic function, the above objectives of the planning organization can be translated into specific objectives for the information systems function of the organization:

(1) stimulate development of better management practices in businesses and public enterprises, through use of computer-based techniques;

(2) stimulate development of entrepreneurial attitudes and skills in personnel of planning and other agencies, organizations, and firms, through development of information systems personnel and catalytic activities;

(3) stimulate development of specialized business activities, either in the public sector or in the private sector, based upon use of information technologies.

Stimulate Development of Better Management Practices through Use of Computer-Based Techniques

There are a number of activities which an organization can do to stimulate development of better management practices:

(1) provide information technology-based tools to support management and planning tasks in an organization: Accounting, inventory management, word processing, cash flow management; project and programme management systems, financial planning systems, fiscal monitoring and control systems, systems to support evaluation and assessment of projects; and others;

(2) train managers and supervisors, in the planning organization and other public sector organizations, and in external private sector organizations, in:

  (a) the accomplishment of particular tasks or functions in a more effective way, building on the use of information technology to support those tasks -- e.g., accounting, population forecasts, and project management;

  (b) the development of management skills through the use of information technology support -- e.g., financial management through use of accounting systems and spreadsheets, and management control through use of MIS and DSS systems;

  (c) Some of the major areas in which these skills can be developed include:

    (i) financial management through use of accounting and financial analysis tools;

    (ii) cost analysis, pricing, depreciation and replacement, and maintenance budgeting;

    (iii) marketing and sales management, using customer data bases, demographic and economic data, and methods for market research, market analysis, and market planning;

    (iv) production planning, scheduling, and delivery scheduling;

    (v) inventory management, logistics management, and traffic management, through use of appropriate systems and data bases;

    (vi) planning and scheduling through use of project management and scheduling tools.

Stimulate Development of Entrepreneurial Attitudes and Skills through Development of Information Systems

There are a number of practical things which an information systems organization can accomplish which stimulate the development of entrepreneurial attitudes and skills. The first and most important by-product of a modern approach to information systems support is the development of positive attitudes towards innovation, change, and entrepreneurial initiative; in addition, there are a number of specific skills which can be taught:

(1) the development of entrepreneurial attitudes and skills, through in part the mastery of particular computer applications, and by the opportunities to continually modify, upgrade, expand, and, in general, innovate the systems and applications which are used;

(2) sensitivity and responsiveness to the customer (user) -- the need for the information systems professional to be sensitive to the users' needs is very valuable training for learning how to understand the needs of "customers" for any product or service;

(3) ability to identify a market need -- a business opportunity -- arises from the same style of alertness and creativity which systems staff should develop in order to serve their user community well;

(4) attitude of taking the initiative, and taking responsibility, similarly is developed by the systems developer in trying to follow-through on developing systems support which meets the users' needs effectively, and by the systems user, who, offered the opportunity of responsive systems support, can take the responsibility for shaping his own information systems support environment, alone or with expert help;

(5) ability to manage people, both skilled and unskilled;

(6) ability to manage projects to time and budget;

(7) ability to plan a business, including market studies, product development, cash flow analysis, and staffing.

(We will expand on these below.)

Stimulate Development of Specialized Business Activities Based Upon Use of Information Technologies

There are a number of specialized activities which can be developed by the information systems function of a planning organization. These are derivative of, and in many cases, directly supportive of, the basic activities in support of the traditional planning activities of the organization.

As one example, in previous work, Manheim and Schofer5/ proposed that, for urban transportation planning agencies, and other planning agencies, the information systems function be seen broadly as the basis of an "information systems utility" with these characteristics:

(a) information is collected on a continuing basis, from a variety of sources;

(b) to be integrated and coordinated on a common, geographically-coded basis, to form an integrated data base or bases and including a wide range of data types;

(c) the resulting resource is then used to provide a variety of information products and services;

(d) to a variety of different clients, including private and public sector organizations and enterprises;

(e) delivered in a variety of different ways.

One example of this would be the selling of social, demographic, and economic data on households in an urban area to private firms and other public agencies for use in market research and product planning. Such a service could be self-supporting or even profitable, and would develop a constituency for such data, justifying more frequent updates than might otherwise be practicable.

The activities to be undertaken to develop products and services include these tasks:

(1) identify specific products and services which can be marketed by the planning organization, directly or through subsidiary or related organizations (public, private, or mixed), or which can be licensed to external organizations (public, private, or mixed);

(2) set up new organizational entities (public, private, or mixed) to develop and/or market products, when existing organizations cannot do the job.

The Central Objective of an Information Systems Organization

The above is a partial and incomplete list of the possible objectives of the information systems function in a planning organization in developing countries. I am sure the reader can add to this list, and further develop examples. This list is sufficient to serve as a basis for identifying training needs, however, and to illustrate the style of organization and personal skills which we have in mind.

> The central objective of an information systems function in a planning organization should be to exploit information technology to help the planning agency be effective as a catalytic instrument of social and economic development.

TRAINING OBJECTIVES FOR INFORMATION SYSTEMS IN DEVELOPING COUNTRIES

Based on these objectives, we see the objectives in the training of information systems professionals in developing countries as falling into two major areas:

(A) training of professionals in the planning organizations;

(B) training of professionals in other organizations.

While our primary focus is on the former, we will make some comments on the latter as well, as this influences numerous policies and practices of the planning organization.

With respect to professionals in planning organizations, training is needed in these major areas:

(1) developing specific computer applications (software) for particular users or organization units;

(2) planning, designing, developing, and installing complete systems;

(3) developing and managing a user support strategy -- a strategy for providing computer support to users both within the planning organization and in external organizations;

(4) developing and managing a major project or business activity;

(5) personal skills and attitudes.

(We will amplify on these in the next section.)

With respect to professionals in organizations other than the planning organization, the same functions apply: Information systems professionals in the planning organization can and should work to develop these same attitudes, skills, and capabilities in personnel in other organizations. This can be accomplished in several modes: By example, by formal training programmes, and by collaborative participation in joint projects.

TRAINING PROGRAMMES

We now turn to the central concern of this paper, the nature of the training programmes which should be provided to prepare information systems professionals to operate effectively in the roles we have suggested.

We will first review the major areas of training, as we have developed them so far, and then look in more detail at several selected areas.

(A) Major training areas:

- (1) management -- skills and techniques;
- (2) organization change, role of change agent, entrepreneurial and innovation skills;
- (3) information systems;
- (4) development -- social, economic, planning, and management;
- (5) planning methods and models;
- (6) training methods, including methods for the training of trainers.

We will now examine several of these areas in greater detail, focusing primarily on information systems and the link to management skills and organization change.

(B) Information systems tools and capabilities -- understanding of, and capabilities to work with, the items identified in table 1:

- (1) hardware
  - (a) computers
    - (i) mainframe, mini, micro, laptop;
    - (ii) batch, remote job entry, interactive;
    - (iii) single site, multiple sites;
    - (iv) stand-alone, dial-up, local network, distributed processing.
  - (b) communications
    - (i) voice, data, mixed
- (2) data bases
  - (a) internal
  - (b) external
- (3) software
  - (a) prepackaged applications (accounting, word processing, technical models;
  - (b) bounded application generators (data base, spreadsheet);
  - (c) evolutionary application generators.
- (4) service delivery mechanisms
  - (a) information processing concepts supported
    - (i) transaction processing;
    - (ii) management information systems;
    - (iii) decision support systems.

- (b) user support provision styles
    - (i) information systems staff formulate specifications, develop software;
    - (ii) user formulates specifications, information systems staff develop software;
    - (iii) user formulates and develops own software:
        - (a) with support of systems expertise:
            - (i) in information systems development;
            - (ii) in user department.
        - (b) without support.

(C) Effective provision of information systems capabilities:

- (1) developing specific computer applications (software) for particular users or organization units:
    - (a) use of prepackaged software -- e.g., general management systems such as accounting, word processing, inventory management; and various planning models and techniques such as population forecasting, statistical analysis, graphics, transportation models, project evaluation models, etc.
    - (b) use of "application-generation" packages -- e.g., developing a budget or project evaluation model using a spreadsheet package; developing a data base of businesses in a project area, or an agency mailing list, using a data base package.
    - (c) use of programming languages -- e.g., Fortran, Pascal, Cobol, and Basic, to develop specialized applications such as a capital budgeting model, a parking space utilization model, and a housing demand simulation model.
    - (d) training users in the use of the developed applications, including development of user documentation (both "on-line" and hard copy), user tutorials (both using the application and in more traditional lecture or hardcopy format), reference manuals, training scripts, training courses, and other training aids and processes.
- (2) planning, designing, developing, and installing complete systems:
    - (a) choosing hardware -- for computing, communications, display (video and hardcopy), data acquisition, etc.
    - (b) choosing software -- systems, application packages, and programmes.

   (c) managing the installation process, including prototyping where appropriate.

   (d) training users in the use of the system.

(3) developing and managing a user support strategy — a strategy for providing computer support to users both within the planning organization and in external organizations:

   (a) identifying user needs.

   (b) understanding the organizational environment -- the structure, processes, and forces in the organization and external to the organization which may influence the goals to be achieved, the barriers to be overcome, user acceptance or rejection, etc.6/

   (c) developing a change strategy -- the formulation of the objectives of a user support strategy; what is to be achieved; how anticipated problems should be handled; in general, these goals should be formulated and an implementation programme designed to deal with the elements of change identified elsewhere as:7/ Problem-working processes, information systems, and human system.

   (d) developing a user support programme -- a programme to provide information systems support to a set of potential or actual users:

      (i) alternative user support philosophies -- the differences in philosophies and approaches of transaction processing, management information systems, decision support systems, and end-user computing.

      (ii) the role of the user in incremental development strategies -- development in stages, with user input and feedback at each stage, and user acceptance and active use before a stage is considered completed.

      (iii) various forms of relations with user organizations -- within the planning agency, or external to it.

      (iv) various types of services to be provided, and issues and approaches in managing the delivery of services -- consulting and advice, system procurement or loan, software selection, software development, training, standards development, etc.

      (v) strategies to develop staff to provide user support services effectively.

      (vi) developing a user community, including formal and informal user groups, newsletters, electronic bulletin boards, workshops, and other activities.

(e) setting up an organization (internal or external) -- identifying and developing staff, selecting and obtaining hardware, software, and training materials.

(f) managing operations of a user support programme -- communications, application developments (doing, advising, or supporting user development activities), and system developments.

(4) developing and managing a major project or business activity:

(a) basic management skills -- accounting, finance, marketing, human resources development, production and operations, and organization behaviour.

(b) specific management techniques -- business planning (including marketing planning and financial planning), managing organization change, new venture planning, strategy formulation and implementation, and project management.

(5) personal skills and attitudes:

(a) leadership;

(b) teamwork;

(c) innovation ability, insight, and creativity;

(d) negotiation;

(e) salesmanship;

(f) communication, especially teaching -- ability to present material effectively in both formal and informal settings;

(g) others.

This listing should be considered illustrative, not complete.

CONCLUSIONS

We have presented a bold and ambitious view of the role of information systems training in developing countries. We believe that this view is consistent with the style of computer use which is now rapidly becoming established throughout the world as a consequence of the revolution in microcomputer hardware and software, in the "third era" of the computer revolution. We also believe that this view is consistent with one important philosophy of the role of planning organizations.

Developing the type of training programme outlined here is ambitious but not difficult or impossible. A training programme of this type can be produced within realistic time and budget constraints.

We recommend that the United Nations Centre for Regional Development undertake development of this type of training programme. As part of this development, the UNCRD should also:

(1) develop case studies which can be used with the training materials.

(2) assemble a central software library to be a major resource for information systems professionals in planning organizations in developing countries.

(3) establish support mechanisms to provide an identity and sense of community and support to the network of information systems professionals who will be implementing this approach.

(4) establish recognition mechanisms to recognize and reward with international prestige individuals who are successful in this approach.

NOTES

1/ This section draws heavily from Marvin L. Manheim, Information Technology and Organization Change: Strategies for Managers (Fourth Annual William A. Patterson Lecture) (Evanston, Il: Transportation Center, Northwestern University) (in press); see also Marvin L. Manheim and Joseph L. Schofer, "Urban Transportation Planning Information Systems for Use in Developing Countries" in United Nations Centre for Regional Development, Information Systems for Urban and Regional Planning: Asian and Pacific Perspectives (Nagoya, 1986); Marvin L. Manheim, "Creativity Support Systems for Planning, Design, and Decision Support," Microcomputers in Civil Engineering 1 (July 1986); Marvin L. Manheim, "Information Technology: A Competitive Tool for Managers" in Proceedings of the Fourth World Conference on Transportation Research (Vancouver: University of British Columbia) (in press); and Daniel Isenberg and Marvin L. Manheim, "Human-Computer Interaction: An Approach to Designing More Effective Decision-Support Systems in Transportation" in Proceedings of the Fourth World Conference on Transportation Research.

2/ For general information on DSS, see: Peter G.W. Keen and Michael S. Scott-Morton, Decision Support Systems: An Organizational Perspective (Reading, MA: Addison-Wesley, 1978); John F. Rockart and Christine V. Bullen, The Rise of Managerial Computing (Homewood, IL: Dow Jones-Irwin, 1986); Ralph H. Sprague, Jr. and Eric D. Carlson, Building Effective Decision Support Systems (Englewood Cliffs, NJ: Prentice-Hall, 1982); Jane Fedorowicz, ed., DSS-86 Transactions (Proceedings of Sixth International Conference on Decision Support Systems) (Providence, RI: College of Information Systems, Institute of Management Sciences, 1986). See also Manheim, "Creativity Support Systems for Planning, Design, and Decision Support"; and Isenberg and Manheim, "Human-Computer Interaction."

3/ Cf. Manheim, Information Technology and Organization Change, chapter 3; and Manheim and Schofer, "Urban Transportation Planning Information Systems for Use in Developing Countries."

4/ See Manheim and Schofer, Ibid.

5/ Ibid.

6/ Cf. Manheim, "Information Technology"; Manheim, Information Technology and Organization Change; and Eliot L. Levinson, "The Line Manager and System-Induced Organizational Change" (Cambridge, MA: Massachusetts Institute of Technology, 1985) (unpublished).

7/ Ibid.

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COMMENT

Katsutoshi Ohta

Marvin Manheim is a well-known expert in transportation systems analysis and decision making. He has successfully articulated here a comprehensive and systematic overview of information systems training in developing countries.

In this abstract and theoretical paper, he has presented the reader with the implications of recent developments in information technology on planning. He notes that we are now in the era of the third computer revolution with the development of mini- and microcomputers, and software technology. (He defines the first and second eras as the transaction processing era and the Management Information Systems (MIS) era, respectively.) In this third era, he argues that the concept of Decision Support Systems (DSS) is receiving growing emphasis and a style called "end-user computing" is emerging.

He observes that the central objective of an information systems function in a planning organization is to exploit information technology to help the planning agency be effective as a catalytic instrument of social and economic development. Based upon this evolutionary perspective of information technology and the role of information systems, he advocates comprehensive training programmes for developing countries.

Manheim's proposal is understandable within the context of planning and decision making environments in developed countries, for example in Japan. But I become somewhat uneasy about its relevancy within the context of developing countries.

I think there are at least three basic prerequisites for the successful introduction of advanced information systems in a given planning agency. First is the ease of access to the main components, i.e., hardware, software, and data bases. In this respect, lowering the costs of hardware certainly increases the affordability of the new information technology. But the lack of reliable data base seems to be a critical obstacle in many developing countries.

Second is the availability of qualified personnel to support the information systems. Training, which is the theme of this paper, is one important element related to this aspect. There is also the problem of maintaining well-trained personnel in the planning organizations. This is especially important since the operation, maintenance, and continuous updating of the data base is a critical element of any successful information system. Because of "job-hopping" into the private sector and other related factors, this is a difficult problem faced by many planning organizations in the developing countries.

The third prerequisite is a favourable planning and decision making environment; especially important is a general understanding among decision makers and government leaders and support for scientific analyses and rational planning procedures based upon objective data. This may be the most important prerequisite which is often lacking in many planning organizations in developing countries. Favourable environments are difficult to develop without clear demonstrations of the usefulness of information systems. In this sense though, it should be observed that clear evidence of the validity of information systems can only be presented in favourable environments -- hence the two are mutually dependent. Perhaps only gradual progress in this area is possible.

Manheim's proposal, as it is here presented, seems to be too "bold and ambitious" for many developing countries at the current time. But I think that he has pointed out the correct direction for the role of information systems, and also he has provided us with a basic framework for the development of a training programme. The next task is to explore the appropriate uses of the evolving information technology which are best suited to the planning and decision making environments of respective organizations. In this process of learning by doing, I hope the low-cost appropriate information systems are gradually developed and become indispensable components of the development management capability of planning organizations in developing countries.

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INFORMATION MANAGEMENT TRAINING FOR URBAN AND REGIONAL PLANNING

Ian Masser and T. D. Wilson

INTRODUCTION

The 1984 Kawasaki International Seminar on Information Systems for Urban and Regional Planning drew attention to the increasingly important role that information systems are playing in improving the quality of planning efforts in both developed and developing countries.1/ The proceedings of this seminar demonstrate the enormous potential for effective decision making that has been opened up by recent developments in information technology (IT). They also indicate the extent to which special training programmes are urgently required if this potential is to be fully exploited by planning practitioners.

This article reviews three different kinds of training needs in the information management field and considers the kind of programmes that might be devised to meet these needs.

The first category is that of the policymakers and senior management who are responsible for developing the overall corporate thinking of the planning agency. Although senior management are unlikely to be engaged in the day-to-day operations related to information management, it is very clear from experience so far that their commitment to projects of this kind is an essential prerequisite for the successful implementation of information management strategies within planning agencies.

The second category relates to the needs of middle and junior management who are involved in monitoring and evaluation. The findings of the Kawasaki seminar indicate that monitoring and evaluation is one of the most important operations within a planning agency from the standpoint of information usage.2/ In this respect, it would be necessary to consider the technical activities involved in monitoring and evaluation and to identify the demands that they make on information management strategies within the planning agency as a whole.

The last category reflects the training needs of those who will be responsible for the programmes that are devised to meet the needs of the two levels of management described above. The lack of suitably trained personnel presents a major obstacle at the present time to the development of training facilities, particularly at the national level. Because of this, it will be necessary to train a new kind of information management specialist within the planning education field for this purpose.

It must be recognized from the outset that there are a number of practical constraints which will have to be taken into account in the development of training programmes to meet these needs. One of the most important of these concerns the amount of time that policymakers and senior, middle, and junior management who are already in post can take off from their job for training purposes. In the discussion that follows, it has been assumed that a period of seven days is probably the maximum that policymakers and senior management could be away from their work and that the corresponding figure for middle and junior management is of the order of fifteen days.

The basic objectives of the training programmes that will have to be devised to meet all three kinds of needs are essentially similar in character. It will be necessary, firstly, to develop programmes which increase the overall level of awareness of those involved, of the potential of information technology and its possible implications for current organizational structures and management practices. Secondly, there will also be a need to broaden the range of the practical experience of those involved in connexion with the application of information technology in planning agencies and to devise programmes which enable them to develop the necessary skills to exploit its potential.

The relative weight that will be given to these two basic objectives in training programmes will vary considerably according to the category of need. It may be expected that the basic emphasis in programmes for policymakers and senior management will be on increasing awareness, whereas middle and junior management will be particularly interested in enriching their practical experience and developing technical skills.

TRAINING NEEDS OF POLICYMAKERS AND SENIOR MANAGEMENT

Training Needs

Apart from those members of staff of any organization who will actually use information technology in their day-to-day work, two groups of people need awareness training if the implementation of information systems is to be planned effectively. These are the policymakers at the central and local government levels and the senior managers of organizations with responsibility for local or regional planning.

The needs of these two groups are overlapping, but with distinctive features for each group. Essentially, the first group need to be convinced of the value of information technology and to be made aware of the benefits that flow from its use in organizations. The latter group also need some treatment of these topics but also need a greater awareness of the problems of implementing IT in organizations and of the consequent problems of organizational change which are attendant upon that implementation.3/

If we accept this division as valid, it is clear that training programmes need to be specifically designed for the two groups, although in practice, because of the overlap and because it may actually be beneficial to integrate the two groups, one might envisage a programme which brought the two groups together at some point. The needs of the two groups are considered together in this section, to assist course planning in a similarly integrated fashion.

Laws and regulations regarding data access

The introduction of IT in organizations has resulted, in most developed countries of the world, in laws and regulations to protect individuals from the misuse of data, and to provide rights of access to data. This is particularly relevant to those with some responsibility for the provision of services to the citizen and, hence, there is a need to maintain files of data related to individuals.

As noted above, there are two sides to the problem: Ensuring confidentiality, so that the facts relating to individuals or their property are revealed only to those with the right to have them for the purposes of the work of the organization; and enabling individuals to know what exists in official records and providing access to the data, or to a printed form of the data. In the United Kingdom the recently implemented Data Protection Act is designed to ensure the former, while Freedom of Information Acts in Canada and the USA are designed for the latter.

Wherever legislation of this kind exists, it will be necessary for the organization to observe the law and to ensure that all employees are aware of the law and act in observance of it. To this end, regulations must be generally produced to ensure that the organization performs according to law. Such regulations define, in effect, the local consequences of law. Both policymakers and senior managers need to be aware of the law and of its consequences for the planning agency. Senior managers, in particular, who are likely to be those with responsibility for creating local regulations may need special training in the consequences of legislation.

The role of training

The implementation of computer-based information systems in organizations demands a trained work force. Some people trained in computer science and systems analysis will be necessary, but it is also necessary to ensure that anyone concerned with any level of systems use knows why tasks may have to be performed differently with the introduction of new systems and how their work fits into the complete scheme of things.

In many cases, staff will seek training opportunities themselves and senior managers, in particular, must be aware of how desirable it is to ensure that those who actively seek training receive it. When IT has been introduced into organizations, many new systems or improvements to systems have been created by "enthusiastic amateurs," with considerable benefits to the organization. Of course, it is necessary to evaluate training courses and advisory agencies may assist in this.

The effective management of information

Until the development of information technology in forms (such as microcomputers) which could be implemented relatively easily in organizations, "information management" was virtually unknown as a concept. Information functions had a "taken-for-granted" character -- they were always part of someone's job and seen, often, as an insignificant part of the job other than in those organizations which employed properly-qualified librarians, archivists, and information scientists.

This has had three consequences: (a) the management of information in such organizations has tended to be haphazard, with documents lost in filing systems and filing systems revised and rerevised as different individuals were given responsibility for particular areas of work; (b) the true costs of organizing information effectively (and, even more, the costs of using it effectively) have not been known; (c) as a result, senior management and policymakers have often had great difficulty in getting the necessary information for the effective management of the organization as a whole.

The general result of this state of affairs is that when the true costs of implementing IT are made known to chief executives and senior managers (currently approximately 7,000 pounds per workstation for office systems in the UK), there are no guidelines based on the costs of existing manual systems which managers can refer to. When we add to this the difficulty in determining the benefits, in money terms, of improvement in information systems, management reluctance to implement becomes easy to understand.

Consequently, considerable attention needs to be given to conveying to policymakers and senior managers the benefits that can arise from the effective use of information systems. This is best done on the basis either of case studies from other organizations or presentations by those who have experienced the benefits directly.

The role of central advisory agencies

Given that the introduction of information systems has many features and is likely to raise many problems from the legal to the technical, it is necessary for an organization to be aware of, and take advantage of, any central advisory agencies that may exist in a given country. For example, in the United Kingdom, the Data Protection Registrar not only seeks to ensure observance of the Act but also endeavours to advise organizations on the extent of their responsibilities under the Act. At the technical level, government departments are able to call upon the services of the Central Computer and Telecommunications Agency for advice on hardware, software, and communications. At the national level in Britain, there are also two bodies with specific relationships to local government which play an advisory role -- the Local Authorities Management Services Advisory Committee (LAMSAC) and the Local Government Operational Research Unit (LOGORU). These organizations are active in undertaking research and training of general relevance to the implementation of IT. The University of Birmingham houses the Institute of Local Government Studies (INLOGOV) which plays a similar role, with an emphasis upon organizational change.

At the policy level, there may be a need to review the resources available for this purpose in a given country or region with a view to improving them. Clearly, senior managers will need to be made aware of the resources that exist to ensure that they are used effectively.

Specific needs of senior managers

The topics above are appropriate for a course for senior managers, but need to be presented in the context of their relevance to their experience. For example, it is necessary to deal with national policies but in terms of their practical consequences for local or regional organizations. Similarly, the treatment of laws and regulations must be in terms of how they are to be observed and their consequences for the control of data bases or other information systems. While there is some scope for joint presentations to policymakers and senior managers, therefore, the individual needs of the different groups ought not to be forgotten.

In addition to the senior managers' needs for awareness of policy issues, they will also need to be made aware of more detailed matters such as:

1. The planning of information systems: The senior managers are not likely to need to be systems analysts or programmers, but they are likely to need to consider the reports of such specialists and to control their activities. Consequently, the senior managers will need to have a general understanding of how information systems are planned and designed and to be aware of terminology used in information systems design such as "human activity systems" or "sociotechnical systems." The use of these terms draws attention to the fact that information systems involve people and that design is not a purely technical matter.

2. The relationship of design to available hardware and software: The pace of change in information technology is so rapid that at any given time organizations are likely to have systems of varying capabilities. There is never a "best" time to implement IT; we can always see new developments round the corner which will improve performance, or increase storage capabilities, or make communication with the machine easier. The senior manager needs to know that while systems must be designed to satisfy organizational needs with whatever hardware and software are available now, it is also necessary to design systems in such a way that advantage can be taken of future developments without a major overhaul of the existing implementation.

3. The practical capabilities of systems and how they can support the work of the manager: It is very difficult for anyone to assess the potential of IT for his work without some exposure to existing systems. Introductory courses on programming are not necessary but an introduction, with practical demonstrations of the main classes of IT hardware and software, is desirable. This should include: (a) an introduction to computer systems and their elements -- mainframe, mini-, and microcomputers; (b) text preparation and editing: standalone word processors and microcomputer packages; (c) spreadsheets, financial modeling, and project planning programmes; (d) data base management systems: the use of standard packages on all kinds of computers from mainframe to microcomputer, preferably demonstrated through the use of a simple package such as Cardbox; and (e) communication networks: local, regional, and international networks and their use for file transfer, facsimile transmission, electronic mail and messaging (including computer-aided telex and teletext), and access to remote data bases; broadcast communications through videotext and teletext; and use of computer-aided telephones with autodialing and directory maintenance.

Some practical experience as it may apply to their own jobs will also be necessary for policymakers. However, it should be carefully designed around appropriate software and hardware. Policymakers are unlikely to be keyboard users, and menu-driven viewdata systems are more likely to gain their interest than are packages which demonstrate word processing or spreadsheets.

4. The process of implementation: The dilemma of the senior manager is that although he is unlikely to be the technical expert in the implementation process, he is likely to be responsible for pulling together the skills of a team which has overall responsibility for the introduction of information systems.

   In this circumstance, he needs a general understanding of how an IT project must be managed and of the stages of implementation. He should be made aware of the advantages of the pilot project in innovation of this kind and of the need for treating the implementation not simply as a technical task, but as one which involves people, the tasks they perform, and the physical environment within which the work is carried out.

   He must understand the need for good project management, for physical changes in the office (e.g., new furniture, ergonomically-designed seating, and trunking for cabling), for evaluation, and for effective meetings management. Perhaps above all, he must be aware (as in the case of the policymaker) of the need for training, and for effective communication about the implementation process throughout the organization).

5. Organizational consequences: Depending upon the nature of the innovation, there are likely to be consequences for the way in which tasks are performed, and these are as likely to create dissatisfactions for those who perform them as they are likely to enrich the job. There are also consequences for labour relations, as noted above in the section on laws and regulations, and for the structure of the organization. For example, a large part of the work of middle managers is concerned with communication up and down the organizational hierarchy -- if electronic systems allow communication between the top of the organization to be more direct, middle managers may find their jobs threatened, with further problems for the organization ensuing.

Training Programmes

The major constraints on the development of training programmes for policymakers and senior managers are those of time and the need to relate the discussion to the nature of the work carried out at these levels. Senior staff are likely to be seriously pressed for time and it will be necessary, as a consequence, to get across the main points of implementation in a short space of time using material which will be seen as relevant, and preferably presented by people the senior manager will recognize as knowledgeable about the problems. At very senior levels possibly no more than half a day will be available to attend an IT awareness seminar, and even at lower levels only two- or three-day programmes may be possible. Consequently, the development of transportable training packages that can be utilized in locations close to the target groups of policymakers and senior managers must be considered in addition to more conventional training programmes.

The examples which follow come from a variety of fields. This is partly due to the nature of the subject: Management has very common characteristics across different kinds of organizations, and the problems associated with IT and its implementation are similarly common. As much can be learnt, therefore, from a programme directed at business as from one specifically related to urban and regional planning.

Short courses

A good example of this category of training programme can be found in the awareness programme for senior government officials that was held in Stockholm in October 1985.4/ As table 1 shows, the programme dealt with the national policy implications of IT through a presentation on developments in Sweden, which is a country with a very sophisticated approach to the problems of data management and control, and later in the week participants heard a presentation on the role of Sweden's Government Administration Computer Centre. The role of a central procurement agency was also dealt with in considerable detail in four presentations. Laws and regulations were also dealt with in considerable depth, with presentations on France and Sweden, and a comparative view of laws and regulations in Japan, the USA, and the United Kingdom.

The remaining parts of the programme dealt with the role of the manager in improving organizational effectiveness through IT, with systems planning, project management, computer literacy, and case studies. The systems planning session dealt with tools for planning, concentrating upon the Swedish model, SK-80. The objective of the project management session was to give an overview of problems and procedures and was supplemented by a presentation on the use of a computer for project administration and a practical demonstration. The aim of the computer literacy session was to acquaint users with the technology and its terminology and a working group session was used to provide experience of actual operation of word processing, spreadsheet, and other software.

The case study sessions covered financial management, national debt management, and personnel and payroll administration, and several working group sessions were provided throughout the week.

The Stockholm conference provides an excellent model for a senior management course, with proper attention to policy, senior management, and personnel efficiency issues. The one gap was the lack of any in-depth attention to training, although the need for training was mentioned in several of the presentations. It should be noted, however, that because of the emphasis that is given to case studies of applications in courses of this kind, the availability of sufficient examples of "best" current practice is a heavy factor in their location.

TABLE 1. AN EXAMPLE OF A SHORT COURSE DESIGNED TO INCREASE AWARENESS OF SENIOR GOVERNMENT OFFICIALS OF IT

UNDTCD Special Appreciation Programme for Senior Government
Officials, Stockholm, 21-25 October 1985

Introduction to information technologies

Monday 21 October

1. Opening

2. Information processing in public administration
    a. Data processing in public administration
    b. Introduction for user managers
    c. Working group session

3. Computer literacy
    a. Overview of computer literacy
    b. Working group session

Tuesday 22 October

1. Information system planning
    a. The management process
    b. System development model SK-80
    c. Working group session

2. Case studies
    a. Financial management and accounting
    b. Government administration computer centre

Wednesday 23 October

1. Case studies continued
    a. National debt management
    b. Personnel and payroll administration

2. Sightseeing

Thursday 24 October

1. Case studies
    a. Project management

2. Procurement of hardware and software
    a. Selection process and criteria
    b. The Swedish model: organization and concepts
    c. The Swedish model: procurement procedures
    d. The Swedish model: basic computer concepts

Friday 25 October

1. Laws and regulations
    a. Laws and regulations in France
    b. Data regulations: the Swedish experience
    c. Comparative perspective

2. Closing session

Transportable training programmes

For the past few months a converted bus has been traveling around Britain carrying exhibition material. It was met at each of its sixteen stops by a team of speakers on the theme "Britain Has IT!: Successful Office Automation."5/ The national campaign is financed by the Department of Trade and Industry (DTI) and is designed to convey to business and other users the results of the DTI's office automation pilot projects in the public sector and similar projects undertaken by individual businesses.

Table 2 shows the programme for the one-and-a-half day workshop -- the half-day directed at chief executives, the full day at senior managers likely to have responsibility for implementing IT. All of the papers, together with a volume of case studies, and the results of a survey of chief executives, were made available to participants.

TABLE 2. AN EXAMPLE OF A SMALL TRANSPORTABLE PROGRAMME

Britain Has IT Programmes

Executive briefing programme:

10:30-11:00	Registration and Coffee
11:00-11:05	Chairman's Welcome and Introduction
11:05-11:35	Celebrity Presentation - A Personal View of Developments
11:35-12:00	The Executive Challenge - What is the Opportunity?
12:00-12:10	Drinks
12:10-12:35	Placing Technology in Context - Critical Factors for Success
12:35- 1:00	A Chief Executive's Next Steps
1:00- 2:00	Lunch and Round Table Discussion

Making it happen - programme:

9:00- 9:30	Registration and Coffee
9:30- 9:35	Welcome and Introduction
9:35-10:15	Where is Technology Taking Us
10:15-10:25	Film "Factors for Success"
10:25-10:45	Coffee and Discussion
10:45-11:40	Office Automation at Work - Case Studies of Installations
11:45-12:40	Lessons from User Experience
12:40- 2:30	Lunch and Round Table Discussion
2:30- 2:40	Film "Problems and Pitfalls"
2:40- 3:25	Office Automation as a Weapon for Competitive Success
3:25- 3:50	Tea and Discussion
3:50- 4:35	Establishing, Resourcing, and Managing Office Automation Projects
4:35- 4:45	Film "A Manager's Guide to Action"
4:45	Close

The programmes for "Britain Has IT!" show a sensitivity to the time constraints of chief executives and senior managers and it can be seen that films were used to put across a number of the ideas. When time is limited this is a very effective strategy in training. Clearly, the aim of a half-day or day workshop of this kind is much more limited than the kind of programme mounted for the Stockholm conference, but where the aim is to raise awareness, impact is perhaps the most important point to consider.

Another example of fitting training to the time constraints is shown in table 3, which outlines a two-day workshop on the theme of introducing IT into another area of local government -- social work.6/

TABLE 3. AN EXAMPLE OF A TWO-DAY WORKSHOP INVOLVING GROUP PRACTICAL SESSIONS

National Institute of Social Work Workshop

Programme

Day 1

9:30-10:00	Arrival and registration
10:00-10:10	Introduction by trainers
10:10-10:25	"Why am I here" - Group activity
10:25-10:35	Report back on key issues
10:35-11:20	Mini case studies in the use of IT (Group analysis of specially-prepared cases)
11:20-11:40	Coffee and general discussion
11:40-12:00	Feedback and discussion on mini-cases
12:00-12:50	Main case study: Managing a data base, phase I (group activity)
12:50-14:00	Lunch
14:00-14:45	Main case study: Phase 2 (group activity)
14:45-15:30	Main case study: Phase 3 (group activity)
15:30-15:50	Tea and general discussion
15:50-16:30	Review of case study

Day 2

9:30-11:00	Briefing on IT (a) The nature of IT (b) IT in Social Services Departments
11:00-11:20	Coffee and general discussion
11:20-12:20	Information problems (Group activity)
12:20-13:00	Problem review
13:00-14:00	Lunch
14:00-15:00	Problem solving (Group activity)
15:00-15:20	Tea
15:20-16:00	The good news . . . and the bad news about IT (Reporting back on the problem-solving group activity)
16:00-16:30	General feedback and evaluation

Note: In the sessions between 11:20 and 15:00, the groups split up so that half participated in the group activity and half in practical demonstrations of IT, switching over part way through the afternoon.

This programme happens to have been run for managers in social services departments, but the outline is sufficiently general for it to serve in almost any other context. The case studies were actually adapted from an earlier set of workshops offered to educational administrators and served well. The highly participative nature of the programme is evident and the main concern was not with experience of IT but with the managerial, organizational, and social consequences of implementing IT solutions to information management problems.

A workshop element of this kind could be built into longer training courses, to give variety to the proceedings and to allow senior managers to share their concerns about technological innovation and to share their solutions to the case problems presented. Dealing with the cases required no technical knowledge of IT, rather a general managerial understanding of the nature of organizational change.

The workshops used a tutorial package prepared by LAMSAC known as the "Management Awareness Programme."7/ This is of interest for training for two reasons: (a) the substantive content of the package, and (b) the fact that it was prepared by a central advisory agency for general use in local government in Britain.

The content of the package is shown in table 4. The programmes use material chiefly from the field of education, but as the programmes are readily accessible on discs and are written in BASIC for the BBC microcomputer, they can be easily and quickly adapted for other fields. For example, in the two-day workshop described above, the material used in the data base system was based upon national statistics in social services, simply by entering new data into the programme.

The aims of this package are:

a. to improve senior managers' general understanding of computing facilities and information technology;

b. an introduction to microcomputers, their limitations, and advantages;

c. to provide keyboard familiarity;

d. to illustrate the potential of on-line systems (i.e., terminal access to a computer).8/

A package such as this, with general managerial content, is widely applicable in organizations and, clearly, can be used as a self-learning tool. This fact draws attention to the possibility of creating a set of instructional programmes for a course and making the package available to participants for use in their home organizations, thereby enabling them to pass on the knowledge gained in the course.

TABLE 4. AN EXAMPLE OF A TUTORIAL PACKAGE DESIGNED TO IMPROVE MANAGEMENT AWARENESS

LAMSAC Management Awareness Package

Contents

1. Personnel stream:

1.1 Recruitment: a simulation of viewdata electronic advertising of jobs, word processing letters to applicants, scheduling interviews, and record generation.

1.2 Wallchart: an electronic wallchart programme for controlling staff leave or course attendance.

1.3 Regrading: record handling to select possible regrading candidates against organizational standards.

1.4 Early retirement: similar to regrading with simulation to show consequences of specific policies.

1.5 Manpower projections: simulation of consequences of financial cuts on manpower.

2. Further applications:

2.1 Solartel: simulation of a private viewdata service, similar to British Telecom's Prestel.

2.2 Housing benefits: simulation of a benefits calculation system.

2.3 Sheet: a small spreadsheet programme with data showing example of application.

2.4 Route: a vehicle routing and mapping programme

3. Comparative statistics: a report generating/data analysis package, using a simple data base system, with searching on specific fields and graphic manipulation of data.

Conclusions

Five main conclusions emerge from this review of the training needs of policymakers and senior managers responsible for the introduction of information systems in urban and regional planning agencies:

1. Policymakers and senior managers must develop an awareness of the potential of IT and its' implications for organizational development.

2. This awareness must include an understanding of the laws and regulations relating to information, training needs, management strategies, and existing central advisory agencies. In addition, senior managers must consider specific needs relating to the planning of information systems, the relationships of design to available hardware and software, the practicable capabilities of systems, and the process of implementation.

3. Two basic approaches can be adopted to the development of training programmes for this group: short courses and transportable training packages.

4. Short courses are particularly appropriate when they can be held in a location that contains examples of current best practice.

5. Transportable training packages are most appropriate where an immediate impact on policymakers and senior management is required.

TRAINING NEEDS OF MIDDLE AND JUNIOR MANAGEMENT

Training Needs

The most important difference between the training needs of policymakers and senior management and those of middle and junior management is that, whereas the former are concerned largely with the managerial and organizational needs of the planning agency in overall terms, the latter are specifically involved in the day-to-day operation of monitoring and evaluation. Consequently, it will be necessary to look at managerial requirements and organizational structures from this particular standpoint. At the same time, it will also be necessary to consider the four main technical activities that are involved in the process of monitoring and evaluation: i.e., problem definition, data collection, information management, and reporting procedures.9/ These topics are likely to constitute the basic syllabus for training programmes to meet the needs of middle and junior management.

Managerial requirements

Any discussion of managerial requirements must include a consideration of the basic objectives of monitoring and evaluation activities and the strategies that can be adopted to the development of monitoring and evaluation systems. With respect to the basic objectives, it must be recognized that monitoring and evaluation activities are judged principally in terms of the contribution that they make to improved decision making and implementation. Consequently, it is essential that they are designed in such a way that ensures they are capable of providing the right information at the right time to the right people within the organization. The success of the monitoring and evaluation operation is therefore heavily dependent on the degree of selectivity of operations that can be achieved, and the development of a mutual understanding between those involved in monitoring and evaluation and those involved in acting upon the findings of their activities.

The basic strategy of monitoring and evaluation systems design must reflect the degree of selectivity and the level of mutual understanding that has been achieved between those involved and their clients. The first task for those involved will be to identify potential users and involve them as far as possible in system design. Consequently, in most cases a step-by-step approach to system development which enables the progress achieved to be evaluated at regular intervals is likely to be the most appropriate strategy for this purpose.

Organizational Structures

The place of monitoring and evaluation activities within the organization as a whole, and the staff implications of particular organizational structures, must also be considered. A basic axiom of monitoring and evaluation is that there is no one best organizational structure that suits all circumstances. This is because the appropriateness of different organizational structures must be judged in relation to the nature of the tasks involved, the working procedures of the planning agency, and the external environment in which it operates. The most important tasks for those involved are to identify the range of activities required and to devise structures that reinforce them.

In the process it will also be necessary to consider the extent to which monitoring and evaluation activities are integrated with the other activities of the planning agency. In some cases the advantages that stem from a high degree of integration will be offset by the likelihood that the outputs of monitoring and evaluation will be trivial and ineffective. On the other hand, the benefits to be derived from a detachment of monitoring and evaluation from other activities may be reduced in other cases by the possibility that they become remote from reality.

Whatever organizational structure is adopted, it will be necessary also to consider its staffing implications. One of the main advantages of establishing separate monitoring and evaluation units within a planning agency is that this makes it possible to hire specialist staff. The discussion of staffing must also consider issues relating to the use of external consultants where in-house resources are lacking. This may be particularly important in relation to the specialist survey design and data collection tasks as well as in the introduction of computer-based information systems.

Problem definition

The first of the four technical activities that have to be dealt with by those concerned with the day-to-day operation of monitoring and evaluation concerns the identification of operational requirements. This requires a careful analysis of the policies and programmes of the agency to identify in as unambiguous a way as possible the objectives that are being sought and the ways in which the progress that is being achieved towards realizing these objectives can be measured. Where strategic issues are involved, it will also be necessary to define the assumptions that underline them so that these can also be included within monitoring and evaluation.

In the process, particular attention must be given to the construction of performance indicators that enable comparisons to be made between the expected and the observed outcomes of key aspects of policies and programmes. It is likely that many types of indicators will be needed for evaluation purposes. These will range from simple target criteria to complex threshold indices which highlight the consequences of moving from one level of investment to another during the planning period.

Data collection

In most strategic planning agencies effective monitoring and evaluation is heavily dependent on the extent to which secondary sources of data can be utilized. Because of the diversity of sources involved, it is likely that questions of consistency and comparability will occupy a great deal of time of those involved.

In most instances consultations with other parts of the planning agency itself, with other agencies, with particular interest groups, and with the public as a whole are likely to play a central role in the intelligence gathering activities that are associated with monitoring and evaluation. The nature and character of these consultations will reflect both the informal and formal networks that exist between those involved and these groups. In each case the outcomes of these consultations are most likely to be fruitful where there is a mutual exchange of information. Consequently, those involved must consider not only the kind of intelligence they wish to obtain but also the information they are able to offer in return when planning their programme of consultations.

In the light of these circumstances, survey research techniques are likely to be employed only in exceptional circumstances by most planning agencies for monitoring and evaluation. Nevertheless, it must be recognized that certain kinds of information can only be collected by these means and that, if this is the case, it will be necessary to devise survey strategies that minimize the costs involved and the delay that occurs before the findings are available to decision makers.

Information management

Information management strategies must be developed for monitoring and evaluation that meet the objectives of efficient data set reduction while also providing facilities for the storage and retrieval of large-scale data sets. The development of information storage and retrieval facilities is likely to be of particular importance in connexion with the monitoring and evaluation of strategic planning policies because of the number of data sets that must be taken into account.

In most planning agencies, information management strategies for monitoring and evaluation are likely to be closely connected to the overall information system philosophy of the agency. However, it is important that the special needs of those involved in monitoring and evaluation are recognized, and that, wherever possible, special-purpose data base management systems are developed for this purpose.

A good case can be made for the utilization of both mainframe and mini- or micro-based computer systems for monitoring and evaluation. This is because mainframe computer systems will be required in situations where large data sets are involved and/or the operational data that is collected within the planning agency has to be accessed. On the other hand, mini- or micro-based computer systems are likely to be particularly useful in connexion with certain tasks such as small-scale management control problems, qualitative data handling, and the graphical presentation of statistical material.

Reporting Procedures

Reporting is only the first stage of a three-stage process whereby the findings of monitoring and evaluation are translated into actions. The second stage of this process involves a detailed reassessment of existing policies and programmes in response to the issues raised by monitoring and evaluation, while the final stage concerns the formal decision procedures required to alter these policies and programmes in the light of this reassessment. The way in which these three stages are handled is likely to vary from agency to agency according to how monitoring and evaluation activities are perceived and the functional allocation of tasks within the agency.

Nevertheless, several different types of reporting procedures are likely to be utilized to meet the needs of those interested in the findings of monitoring and evaluation. Firstly, decision makers will require brief issues reports on particular topics that enable them to set in motion the procedures that are required in order to take corrective actions. Such reports will be designed for internal consumption and are likely to be confidential in nature. Secondly, consultation groups and other interested parties will require more general position statements to be prepared which summarize the overall progress achieved towards plan implementation. These reports may have a wide circulation and are utilized in some cases directly by planning agencies as a vehicle for intelligence gathering and consultation purposes.

Training Programmes

The discussion above indicates the range of topics that must be included in training programmes for middle and junior management involved in monitoring and evaluation. Two different kinds of approaches can be adopted to meet these training needs. The first of these is essentially a development of conventional teacher-pupil style of teaching whereby it is assumed that the teacher is in possession of knowledge and/or skills that must be imparted to the pupil who lacks them. The adoption of this kind of approach is particularly evident in short courses involving formal presentations of material in lecture form and practical demonstrations of skills and equipment. The second approach is based on the model of the expert seminar which seeks to facilitate the exchange of ideas between the participants who are able to contribute to the discussion on more or less equal terms. This kind of approach is particularly evident in brainstorming sessions and workshops which utilize relatively-informal discussion group procedures. In cases of this kind, the practical component is less likely to take the form of demonstrations of skills or equipment and more likely to be evident in cooperative problem-solving projects that are designed to reinforce the participants' experience.

The appropriateness of these two approaches is likely to vary according to the circumstances. Taught courses are likely to be particularly suitable where there is an obvious gap between the organizers and the participants in terms of either the depth of their experience or the level of skills involved. Consequently, they are most useful for introductory purposes and in situations where an entirely new skill must be acquired. Workshops are most appropriate where all the participants have an extensive knowledge of the topics being covered. They are likely to be particularly useful at the international level, where this experience is put into a broader perspective by the introduction of a cross-national comparative dimension to the discussion, which highlights the extent to which personal experience is the product of national cultural factors that do not necessarily operate in other countries.

With these considerations in mind, a number of examples of training programmes in the monitoring and evaluation field will be reviewed. Table 5 illustrates the main features of these programmes.

TABLE 5. THE MAIN FEATURES OF THE PROGRAMMES REVIEWED IN THIS SECTION

	Courses	Workshops
Without practical component	PTRC course on "The monitoring process in planning." ILO/ARTEP course on statistical and financial appraisal techniques for monitoring and evaluation	Sheffield workshop on "Information management for monitoring." UNAPDI/UNCRD/UNICEF consultative meeting on "Monitoring and evaluation of social development programmes."
With practical component	UNCHS course on "Data management for human settlement development."	World Bank regional workshops on "The monitoring and evaluation of rural development projects."

Courses

A typical example of the course-based approach in the monitoring and evaluation field can be seen in table 6. This contains the syllabus of a two-day course on "The Monitoring Process in Planning" organized by PTRC Education and Research Services Ltd. in London during 1980. The course is built around eight lectures given largely by practitioners who had been directly involved in monitoring and evaluation. The sequence of lectures presents an overview of the state of the art within British planning. The first of these lectures by the course organizer introduces the terminology and the basic concepts involved. This is followed by three other general presentations. The first of these set monitoring and evaluation in the overall context of decision making within a local authority, while the second considers the requirements for monitoring and review that have been imposed on local planning authorities by central government in the form prescribed by the Department of the Environment. The last of the three general presentations is concerned specifically with information management. It reviews the computer-based information systems that are available and identifies a number of issues that need consideration when selecting a particular form of information management strategy.

TABLE 6. AN EXAMPLE OF A STRUCTURED PRESENTATION OF MATERIAL FOR MIDDLE AND JUNIOR MANAGEMENT

The Monitoring Process in Planning PTRC Course,
London, 26-27 March 1980

Session 1.	The monitoring process: an introduction. K. Francis (Hampshire CC)
Session 2.	Monitoring and decision making. F. J. C. Amos (University of Birmingham)
Session 3.	Requirements for monitoring and procedures for review - a DoE view. G. Hackman (Department of Environment)
Session 4.	Organizing information for monitoring. J. Willis (Merseyside CC)
Session 5.	Monitoring and review of strategic planning policies. T. Duc (East Sussex CC)
Session 6/7.	Monitoring local planning policies: the problems of monitoring and review in a two-tier setup. R. Howes (Nottinghamshire CC) S. Brazier (Nottingham DC)
Session 8.	A systems/issues approach to monitoring. J. R. England (Cleveland CC)

The remaining lectures present case studies of current best practice in various local planning authorities. The first and last of these outline the contrasting approaches developed by two county planning authorities, while the two other contributions consider monitoring and evaluation from the standpoint of the interrelationships between county and district levels.

The course was designed for an audience of twenty-five to forty practitioners in local planning authorities in Britain. The presentations from the lectures were supplemented by written handouts varying from three to ten pages in length. The programme was organized in such a way that there was an opportunity for question and answer sessions at the end of each of the presentations.

A much more elaborate example of the course-based approach which contains a well-developed practical component is the programme on "Data Management for Human Settlement Development" organized by the United Nations Centre for Human Settlements (UNCHS)(Habitat) in Nairobi. The focus for discussion in this course is the urban data management software (UDMS) package developed by the UNCHS (Habitat) and the programme is designed "to introduce urban planning management personnel to new data management concepts and their application to urban development."10/ In this case, data from a city in the region is used to illustrate how the microcomputer equipment and the software package could assist planning operations. It is hoped that, by these means,

> each participant will be familiar with the contents of the manual on data management for urban and regional development.
>
> each participant will have a working knowledge of microcomputer applications to urban data management.
>
> each participant will have the opportunity to conduct data management operations on a data file of their own creation.
>
> each participant will be able to evaluate the new data management techniques in the context of their own urban development problems.11/

The basic programme for a twelve-day workshop for eighteen to twenty-four participants is shown in table 7. From this, it can be seen that the course consists of thirteen lectures outlining the issues involved in urban data management and explaining the principles underlying the UDMS package, together with six seminars, eleven small group sessions (i.e., three to four participants each), and twelve laboratory work periods associated with the practical work. The first week of the course is devoted largely to explaining the concepts and methods involved in familiarizing participants with microcomputer systems. In this respect, particular attention is given to various types of file handling and map creation exercises. The second week of the course is spent mainly on applications exercises which emphasize the need for computer-supported data analysis.

It should be noted that, although the sequence of the overall programme of activities is determined in advance, a great deal is left to participants to develop their own ideas in small group and laboratory work. ,Nevertheless, the extent to which these could be developed is limited by the specific demands of the UDMS software. A typical illustration of the kind of application developed by participants can be found in the course manual. This describes an exercise carried out during a workshop held in Bogota during 1981, which sought to determine the optimum location of three commercial centres within the urban area of Bogota.

The UNCHS (Habitat) package is intended for general usage and floppy discs containing the software are made available on request to potential users. An instructor's manual is also available for potential course organizers. This contains suggestions regarding the staffing and facilities required for such courses. In staffing terms, the appointment of three instructors is recommended (a physical planning instructor, an

TABLE 7. AN EXAMPLE OF A PRACTICALLY-BASED COURSE ON DATA MANAGEMENT

Workshop on Data Management for Human Settlements Development - Schedule

FIRST WEEK							WEEKEND	
1ST DAY MONDAY	2ND DAY TUESDAY	3RD DAY WEDNESDAY	4TH DAY THURSDAY		5TH DAY FRIDAY		6TH DAY SATURDAY	7TH DAY SUNDAY
9:00 - 10:30 Introductory Statement	LECTURE 3 The Planning Process and Data Management	LECTURE 6 Assembling on Information System 1	SEMINAR 2 Project Proposal Presentation		LECTURE 10 Information Products		OPEN LAB	FREE TIME
10:30 - 11:00 BREAK	BREAK	BREAK	BREAK		BREAK		FREE TIME	
11:00 - 12:30 LECTURE 1 Workshop Overview	LECTURE 4 UDMS Presentation I	LECTURE 7 UDMS Presentation II	LECTURE 8 Assembling on Information System II		LECTURE 11 Systems Limitations			
12:30 - 14:30 LUNCH	LUNCH	LUNCH	LUNCH		LUNCH			
14:30 - 15:30 LECTURE 2 Introduction to Data Management Concepts and Terminology	LECTURE 5 Data and Information Requirements for Urban Planning	SEMINAR 1 Project Orientation	LECTURE 9 User/Systems Relations and Systems Evaluation		LECTURE 12 Technical and Personnel Aspects of Information Systems			
15:30 - 16:00 BREAK	BREAK	BREAK	BREAK		BREAK			
16:00 - 17:30 LAB 1 Introduction to the Use of Microcomputers	LAB 2 File Formation Exercise	LAB 3 Map Creation Exercise	LAB 4 Project Work Groups 1.2	GROUP SESSION 4 Group Project Work Groups 3.4.5.6	LAB 5 Project Work Groups 5.6	GROUP SESSION 5 Group Project Work Groups 1.2		
17:30 - 20:00 DINNER	DINNER	DINNER	LAB 4 Project Work Groups 3.4	DINNER	LAB 5 Project Work Groups 3.4	DINNER		
20:00 - 22:00 GROUP SESSION 1 Reading Session	GROUP SESSION 2 Reading Session	GROUP SESSION 3 Project Formulation (Instructor Assisted)	LAB 4 Project Work Groups 5.6	GROUP SESSION 4 Group Project Work Groups 1.2	LAB 5 Project Work Groups 1.2	GROUP SESSION 5 Group Project Work Groups 3.4.5.6		

TABLE 7. AN EXAMPLE OF A PRACTICALLY-BASED COURSE ON DATA MANAGEMENT (Continued)

Workshop on Data Management for Human Settlements Development - Schedule

SECOND WEEK

8TH DAY MONDAY		9TH DAY TUESDAY		10TH DAY WEDNESDAY		11TH DAY THURSDAY	12TH DAY FRIDAY
9:00 - 10:30 LECTURE 13 A Model for the Implementation of an Urban Information System		9:00 - 11:10 LAB 8 Project Work Groups 1.2	GROUP SESSION 8 Groups 3.4.5.6	LAB 10 Project Work Groups 1.2	GROUP SESSION 10 Groups 3.4.5.6	9:00 - 10:40 LAB 12 Groups 1.2	10:00 - 10:30 SEMINAR 5 Project Comments and Evaluation
10:30 - 12:25 LAB 6 Project Work Groups 1.2	GROUP SESSION 6 Groups 3.4.5.6	11:10 - 13:20 LAB 8 Project Work Groups 3.4	GROUP SESSION 8 Groups 1.2.5.6	LAB 10 Project Work Groups 3.4	GROUP SESSION 10 Groups 1.2.5.6	10:40 - 12:20 LAB 12 Groups 3.4	11:00 - 12:30 SEMINAR 6 Review and Evaluation
12:25 - 14:20 LAB 6 Project Work Groups 3.4	GROUP SESSION 6 Groups 1.2.5.6	13:20 - 15:30 LAB 8 Project Work Groups 5.6	GROUP SESSION 8 Groups 1.2.3.4	LAB 10 Project Work Groups 5.6	GROUP SESSION 10 Groups 1.2.3.4	12:20 - 14:00 LAB 12 Groups 5.6	LUNCH Free Time
14:20 - 16:15 LAB 6 Project Work Groups 5.6	GROUP SESSION 6 Groups 1.2.3.4	15:30 - 17:40 LAB 9 Project Work Groups 1.2	GROUP SESSION 9 Groups 3.4.5.6	LAB 11 Project Work Groups 1.2	GROUP SESSION 11 Groups 3.4.5.6	14:00 - 16:00 SEMINAR 3 Final Presentation 1 Groups 1.2.3	15:30 - 17:00 Closing Ceremonies
16:15 - 18:10 LAB 7 Project Work Groups 1.2	GROUP SESSION 7 Groups 3.4.5.6	17:40 - 19:50 LAB 9 Project Work Groups 3.4	DINNER	LAB 11 Project Work Groups 3.4	DINNER	16:00 - 16:30 16:30 - 18:30 SEMINAR 4 Final Presentation II Groups 4.5.6	
18:10 - 20:05 LAB 7 Project Work Groups 3.4							
20:05 - 22:00 LAB 7 Project Work Groups 5.6	GROUP SESSION 7 Groups 1.2	19:50 - 22:00 LAB 9 Project Work Groups 5.6	GROUP SESSION 9 Groups 1.2	LAB 11 Project Work Groups 5.6	GROUP SESSION 11 Groups 1.2	DINNER	

information system concepts instructor, and an information systems applications instructor), together with a secretary to assist with the organization of the course and the preparation of materials for participants.12/

The main advantages of the course-based approach are clearly evident from these examples. Courses such as the PTRC course enable middle and junior management planning agencies to obtain a relatively inexpensive introduction to the broader issues involved in monitoring and evaluation, while courses such as the UNCHS (Habitat) data management course provide practically-oriented training which enables participants to develop new skills.

It should be noted that the need for new skills development in monitoring and evaluation is by no means restricted to the information management field. A very different area of application can be seen from the activities of the Asian Employment Programme of the International Labour Organisation in connexion with the district development programme of Sri Lanka.13/ In this case, it is recommended that on-the-job training be provided for district development officers to remedy their lack of statistical knowledge and financial appraisal techniques. Consequently, a simple course in applied statistics and financial analysis is proposed which uses data collected throughout the project. The syllabus for this course includes:

> numerical and graphical representation of time series, including the use of index numbers and price deflators; presenting group data in contingency tables; comparisons of group averages, including the use of standardized averages and averages of dispersion; financial analysis, such as the calculation of receipts over costs, calculation of discounted present value and cost/benefit ratios, and comparisons of certain cost elements between projects/programmes.14/

Workshops

A typical example of a workshop in the monitoring and evaluation field is the one-day round table discussion held at the University of Sheffield in March 1984 to exchange ideas and experience on current approaches to information management in Britain. The starting point from this discussion was the findings of a survey of information management in English county planning offices that had been carried out by the organizers previously.15/ In this survey each county planning authority was asked to complete a postal questionnaire which sought to expose its attitudes towards information management in the context of monitoring and evaluation. Respondents were asked, for example, to indicate which of a number of contrasting pairs of statements about different aspects of monitoring and evaluation corresponded most closely with the approach adopted by their own department. They were also asked similar questions about their approaches to information management.

On the basis of the findings of this survey, a number of stereotypes of current attitudes towards information management were constructed by the workshop organizers and used as a starting point for comparative analysis. In the process, a number of issues were identified by the participants as needing further discussion. Consequently, all the respondents were invited to participate in a round table discussion structured around these issues. The formal agenda was limited to a list of topics (see table 8) and a general indication of the amount of time that was to be allocated to monitoring and evaluation as against information management issues.

With these considerations in mind, participants were asked to carry out a number of tasks before the meeting. The most important of these was the preparation of a brief outline of the state of the art in their authority with respect to these issues. These outlines were made available to the other participants and provided a useful starting point for the general discussion.

The round table discussion was attended by representatives from eleven county planning authorities, the Department of the Environment, and a number of academic researchers in the field of information management. After the meeting, a report was prepared by the organizers and circulated to all participants (including those who had not attended the meeting), inviting further comments. This drew attention to five main themes: (a) the relationship between monitoring and information management in the context of structure planning; (b) the nature of other monitoring activities in county planning authorities; (c) the nature of the arrangements that have been made for the exchange of information between counties and districts; (d) the role of information managers in policy formulation; and (e) approaches to system development.16/

A good example of the workshop approach at the international level is the nine-day consultative meeting that was jointly organized by the United Nations Asian and Pacific Development Institute, the United Nations Centre for Regional Development, and the United Nations Children's Fund in Manila in February 1978 to pool the experience obtained as a result of the monitoring and evaluation of social development programmes. The participants included thirty-five national experts engaged in programme planning and monitoring and evaluation in six countries from the Asian and Pacific region, together with the organizers. The specific objectives of the meeting were to review current practice, to identify critical issues, and to formulate specific recommendations on the action needed to improve practice.17/

A distinctive feature of the meeting was that a major proportion of the proceedings were conducted in small working groups to facilitate the active involvement of participants to promote a full exchange of experience and opinion. Each working group was asked to consider the same specific agenda topics simultaneously and was invited to present its findings at a concluding plenary session.

Several other features of the meeting are of interest. The plenary and working group sessions were supplemented by two study visits to Philippine projects selected as examples of best practice. There was also a feedback and debriefing session for paper writers to discuss arrangements for the revision of each report.

TABLE 8. AN EXAMPLE OF THE TOPICS FOR A ROUND TABLE DISCUSSION

Round Table Discussion on Issues Relating to Information Management
in County Planning Authorities, Sheffield, 16 March 1984

Topics for discussion

1. The implications for monitoring

   a) *Organization structures*: What range of skills is needed for effective work on information management, monitoring, and policy generation? What is the most effective organizational structure for information management purposes? Is there a case for separate section dealing exclusively with information management issues?

   b) *Internal reporting procedures*: What channels exist for internal reporting purposes? What is the desirable balance between regular reporting procedures (e.g., annual reports) and *ad hoc* reports on issues of immediate relevance?

   c) *External reporting and consultation procedures*: How far are information and reports produced for monitoring purposes made available to other local authorities, interested groups (e.g., Chamber of Commerce) etc.? What provision is made for consultation on issues connected with monitoring activities?

   d) *Presentation of information*: How can data reduction be achieved so that only the most pertinent information is presented in the most understandable form? What is the scope for computer graphics in this respect? Are there any case studies of experience?

2. The implications for information management

   a) *The management of data vs. the management of information*: Monitoring demands access to both, but are the systems being developed and used too closely directed towards the management of data? Are adequate systems for text retrieval available?

   b) *Problems of the exchange of information*: Different levels of government, different levels of local government, and different departments of the same authority may have data/information resources of use to planning and may have a need for resources available in Planning Departments. Many barriers exist to interchange: Has anyone found useful working solutions to the problems?

   c) *Cooperative systems development*: Many tasks of data collection and analysis are common across planning authorities. Is there sufficient cooperative development of information systems? What are the problems? What the benefits?

   d) *Technological developments and the problem of choice*: A variety of technological solutions exists for problems of information management. They range from in-house viewdata systems, through mainframe-supported terminals, to computers linked into networks. What problems exist in deciding what kind of system to implement? Are there any case studies of the decision process?

A good example of the workshop approach which also includes a practical component can be found in the series of regional workshops on the monitoring and evaluation of rural development projects that was organized by the World Bank during 1979 in San Jose, Nairobi, and Kuala Lumpur.18/ The aim of these workshops was:

> to provide an opportunity for individuals actively involved in the mechanisms of rural development to (1) exchange information, ideas, and techniques about projects M and E, and (2) derive lessons from field experience that could be used to improve the design and operation of future M and E systems.19/

The discussion at these workshops focused on three major themes identified prior to the meeting by potential participants and those involved in organizing them. These related to the managerial, technical, and institutional aspects of monitoring, respectively. With these considerations in mind, participants were asked to prepare case studies based on their own experience in advance of the meeting to promote the cross-fertilization of operational experience. Part of each workshop was also devoted to a practical exercise.

The Kuala Lumpur workshop lasted eight days and was attended by thirty-six project managers from both central and regional development agencies in seven countries as well as by World Bank and international agency officials. Twenty-one case studies were submitted in advance of the workshop and discussed in plenary and small group sessions during the first four days of the meeting. The last four days were devoted to a practical exercise based on the Muda irrigation project in Malaysia.

The practical exercise is of particular interest as a good example of how a practical component can be built into workshops of this kind. Its objective was "to involve the participants in designing, as realistically as possible, practical M and E subsystems for the various project components" and "the results of these exercises were compared with the actual M and E system, so that the M and E staff of Muda could derive some benefit from alternative approaches suggested by the participants."20/

Participants were organized into working teams based on their previous experience and asked to consider one of five major project components (see table 9). Each team was asked to consider its project component as an integral project in itself and to identify its objectives, assess its information needs, consider the data collection tools required, evaluate the quality of the reporting system, and recommend an institutional model for a project-specific monitoring and evaluation unit. The findings of each team were presented for discussion in a plenary session of the workshop.

The value of practical exercises of this kind, as a way of overcoming the tendency towards fragmentation that is inherent in any attempt to structure the discussion around a limited number of major themes, is endorsed by both the organizers and the participants of the workshop.

> During the field exercises, the participants were confronted, in a practical way, with typical questions that arise in the design and implementation of project-specific monitoring and evaluation systems. This practical experience enhanced the

> value of the regional workshop methodology. In the workshop evaluation, participants were unanimous in endorsing the value of the field exercise and appreciative of the cooperation and hospitality of the host country in providing the opportunity of conducting fieldwork in such a meaningful fashion.21/

These examples indicate the benefits that are to be derived from the workshop approach to the training of middle and junior management in the monitoring and evaluation field, in facilitating the exchange of ideas and expanding the range of individual experience. However, one feature of all three examples is worth bringing to the attention of potential workshop organizers. In essence, the success of these workshops is very heavily dependent upon the prior work that is carried out not only by the organizers but also by the participants. The experience of all three workshops suggests that the quality of the latter's contribution is very much dependent on the amount of preparatory work that they undertook before the workshop. Consequently, it must be recognized that the amount of time that must be invested in workshop participation by participants is inevitably much greater than that required for course participation.

TABLE 9. AN EXAMPLE OF THE TOPICS COVERED BY GROUPS IN A PRACTICAL EXERCISE

Muda Project
Project operations considered in practical exercise during Kuala Lumpur workshop, December 1979

1. Irrigation water supply

   Objective: the optimal use of scarce water resources particularly at the start of the growing season.

2. Agricultural credit

   Objective: the provision of an adequate service of renewal credit for promoting modern agriculture with the social advantage of placing purchased imports within reach of the poorer farmers.

3. Agricultural input supply

   Objective: the maximization of farm inputs (e.g., chemical fertilizers) and their supply through institutionalized channels).

4. Agricultural extension services

   Objective: the promotion of modern farming methods and farm inputs through extension services.

5. Socioeconomic dimensions

   Objective: to evaluate the impact of the project in terms of increased income through better farm production and the distribution of such increases.

Conclusions

Five main conclusions can be drawn from this review of the training needs of middle and junior management involved in monitoring and evaluation. These can be summarized in the following terms:

1. Training programmes for middle and junior management involved in the day-to-day operation of monitoring and evaluation must take account of both the managerial and organizational aspects of the field, and the technical activities associated with problem definition, data collection, information management, and reporting procedures.

2. There are two basic approaches that can be adopted to the development of training programmes for this client group: i.e., courses and workshops.

3. The course format is particularly appropriate where there is a knowledge and/or skill gap between those presenting materials and the participants. It is especially useful for introductory purposes and/or where new skills have to be learnt.

4. The workshop format is most appropriate where the participants have more or less similar level of experience. It is especially useful for brainstorming sessions where it is hoped to generate new ideas and for international comparisons designed to put national practice into a broader perspective.

5. Both courses and workshops can benefit considerably from the inclusion of a practical component. Some measure of hands-on experience is particularly desirable in courses designed to teach new skills. The practical dimension of workshops is best developed through collective problem-solving exercises designed to extend and enrich individual experience.

TRAINING NEEDS OF THE ORGANIZERS OF TRAINING PROGRAMMES

Training Needs

In addition to providing training programmes for senior, middle, and junior management personnel involved in monitoring and evaluation, it is necessary also to consider the training needs of those people who are likely to be responsible for organizing programmes to meet these needs. The bulk of these training requirements should be handled by courses and workshops at the national level in the medium- to long-term, but to achieve this objective special training programmes will have to be devised to create the personnel that will be required for this purpose.

The discussion above indicates that two distinct areas of knowledge and skills are involved in this case. The first of these concerns the need to develop a familiarity with the nature and potential of recent developments in information technology. This requires a broad knowledge of both hardware and software capabilities and an ability to utilize this knowledge wherever necessary in the development of practical exercises related to skill acquisition. The second area relates to the environment within which monitoring and evaluation takes place in planning agencies.

This requires a broad grasp of management concepts and practices as they are utilized in these agencies, as well as an understanding of the substantive problems that need to be resolved through planning operations.

It can be argued that courses and workshops to meet the training needs of senior, as well as middle and junior management can be organized by a combination of specialists from these two areas. However, it can also be argued that it is preferable to place the training programme organization in the hands of individuals who have direct experience in one of these areas and have also undergone their training in the other. Insofar as the needs of middle and junior management are concerned, with their emphasis on day-to-day operations, it seems particularly desirable that those responsible for programme planning should have direct experience in planning practice and are able as a result to see the issues involved in information technology from this standpoint. Because of this, special attention must be given to the training needs of these individuals with respect to the development of their understanding of the consequences of recent developments in information technology.

Training Programmes

To meet the training needs outlined above, it will be necessary for special programmes to be developed at the postgraduate level. Because of the knowledge and skills that must be acquired within these programmes, it is likely that they will involve at least a year's full-time study.

A good example of the kind of training programme that might be used for this purpose is the one-year M.Sc. Course in Information Technology and Planning that has recently been launched by the Department of Town Planning at the University of Wales Institute of Science and Technology (UWIST). The objective of this course is "to develop a practical appreciation of the role of IT in public policymaking, and become personally skilled in its use."22/ The course is aimed at both practising planners who wish to develop specialist experience and at students who intend to enter the profession.

The basic syllabus for the course is outlined in table 10. From this, it can be seen that the course is divided into two parts. The first part includes a number of foundation subjects, applied subjects, and specialist subjects, as well as course work associated with each subject. The second part involves the completion of a dissertation in a chosen field of IT and planning. This enables the student to explore an aspect of the field in some depth and also to gain practical experience in the application of computer-based methods.

Five foundation subjects are included in part 1. These introduce students to the principles of computing science, information systems philosophies, programming languages, and microcomputing applications, as well as contemporary planning issues. All students are also required to take four courses on applied subjects. The first two of these describe the computer-based modeling techniques that are used in planning, while the third considers some of the social implications that arise out of the development of information technology. The final applied course examines the specific information needs associated with planning practice.

TABLE 10. AN EXAMPLE OF A POSTGRADUATE COURSE DESIGNED TO DEVELOP AWARENESS OF DEVELOPMENTS IN INFORMATION TECHNOLOGY

M.Sc. in Information Technology and Planning at UWIST

Syllabus

Part 1

Foundation subjects (compulsory)
- Principles of computing
- Data processing and information systems
- Principles of programming
- Principles of microcomputing
- Contemporary town planning issues

Applied subjects (compulsory)
- Statistical modeling
- Models for forecasting and planning
- IT and society
- Information in planning practice

Specialist subjects
- Set A (two subjects to be selected)
  - Computer graphics and design
  - Development control systems
  - Analysis of census data
  - Computer-assisted cartography

- Set B (one subject to be selected)
  - Advanced statistical modeling
  - Advanced planning models
  - Expert systems in planning
  - Data base theory and practice

Part 2

Dissertation in a chosen area of information technology related to planning.

In addition to these compulsory subjects, students are expected to choose three specialist options from two sets of subjects offered by the department. The range of these options includes both practical applications such as computer graphics and development control systems, and research fields such as expert systems and data base theory.

The department is able to mount such a course because of the investment it has already made in IT teaching in its professional undergraduate planning course.23/ As a result, a large proportion of the teaching of most of the practical work is carried out in-house.

Conclusions

Five main conclusions can be drawn from the discussion of the training needs of those who are likely to be responsible for the development of courses and workshops of senior, middle, and junior management personnel involved in monitoring and evaluation. These may be summarized as follows:

1. Two distinct types of knowledge and skills are required by those responsible for organizing training programmes in the monitoring and evaluation field. These involve familiarity with recent developments in information technology and an understanding of the environment within which those concerned with monitoring and evaluation operate, respectively.

2. The need for specialist training in the IT field to complement initial planning experience is particularly evident insofar as the training needs of middle and junior management are concerned.

3. Special training programmes to meet these needs will have to be developed at the postgraduate level. These are likely to involve at least one year's full-time study.

4. The curricula of these programmes will have to include both the principles of information technology and their application to planning practice.

CONCLUSIONS

Some of the most important information management training needs for urban and regional planning have been reviewed in the discussion above. Three different categories of needs have been identified relating to policymakers and senior management, middle and junior management, and course organizers, respectively. Most of the discussion has been devoted to a detailed consideration of the training requirements for each of these categories and an examination of the kinds of programmes that might be developed to meet these needs. In this way, some indication has been given of the part that international agencies such as the United Nations Centre for Regional Development can play in developing training programmes for urban and regional planners. It must be recognized that the precise form of future programmes will be dependent on factors that lie largely outside the scope of this paper, but it is hoped, nevertheless, that the above discussion will provide a useful starting point for those concerned in formulating them.

NOTES

1/ Kawasaki International Seminar on Information Systems for Urban and Regional Planning, Kawasaki City, 3-6 October 1984, "Information Systems for Urban and Regional Planning: Their Use and Application in Developed and Developing Countries." Report and Summary of Proceedings (Nagoya: United Nations Centre for Regional Development, 1984).

2/ See, for example, Ian Masser, "Monitoring and Evaluation of Local and Regional Planning in Developing Countries, with Particular Reference to Metropolitan Regions" in United Nations Centre for Regional Development, Information Systems for Urban and Regional Planning: Asian and Pacific Perspectives (Nagoya, 1986).

3/ United Nations Dept. of Technical Co-operation for Development (UNDTCD), "Modern Management and Information Systems for Public Administration in Developing Countries" (ST/ESA/SER.E/36) (New York: United Nations, 1985) (Sales No. E.85.II.H.1).

4/ UNDTCD course materials for the Special Appreciation Programme for Senior Government Officials on "Introduction to Information Technologies," Stockholm, 21-25 October 1985.

5/ PA Consultants Group, "Britain Has IT!: Successful Office Automation" (See the conference materials, speakers' papers, case studies, and survey of chief executives) (London, 1985).

6/ National Institute for Social Work course materials (London, 1985).

7/ Local Authorities Management Services Advisory Committee, "IT Management Awareness Programme: Applications Demonstrations" (London, 1983).

8/ Ibid. p.1.

9/ Masser, "Monitoring and Evaluation of Local and Regional Planning in Developing Countries."

10/ United Nations Centre for Human Settlements (Habitat), Data Management Instructor's Manual (Workshop on Data Management for Human Settlement Development) (Nairobi, 1983), p. 2.

11/ Ibid.

12/ Ibid., pp. 71-2.

13/ See G. Edgren, "Information System for Monitoring Development Indicators at District Level: A Demonstration Exercise for Nuwarya Eliya, Sri Lanka" (Bangkok: ILO-ARTEP, 1982).

14/ Ibid., pp. 34-5.

15/ Ian Masser and T. Wilson, "Approaches to Information Management in County Planning Authorities in England and Wales: A Survey," Urban Studies 21 (1984): 415-25.

16/ Ian Masser and T. Wilson, "Information Management in County Planning Authorities: Some Topics for Further Consideration," Burisa 65 (1984): 7-9.

17/ See "Monitoring and Evaluation of Social Development Programmes." Summary Report of a Consultative Meeting, Manila, 15-23 February 1978 (Bangkok, 1978), p. 2.

18/ See International Bank for Reconstruction and Development, "Managing Information for Rural Development: Lessons from Eastern Africa" (Staff working paper; 379) (Washington, DC, 1980); see also its "Monitoring Rural Development in East Asia" (Staff working paper; 439) (Washington, DC, 1980).

19/ See IBRD, "Managing Information for Rural Development," p. 3.

20/ See IBRD, "Monitoring Rural Development in East Asia," p. 27.

21/ Ibid., p. 32.

22/ See the course outline for M.Sc. in Information Technology and Planning (Cardiff: Dept. of Town Planning, University of Wales Institute of Science and Technology, 1985), p. 2.

23/ See M. Batty, "Information Technology in Planning Education" (Papers in planning research; 80) (Cardiff: Dept. of Town Planning, University of Wales Institute of Science and Technology, 1984).

COMMENT

Ralph Gakenheimer

The paper is useful in outlining the structural requirements for information frameworks that need to be understood by participating professionals. I would like to extend the paper by suggesting the need to tie this structure to substance. To request discussion of "agency objective" or regard the system as aimed at "monitoring and evaluation" for planning is not enough. It cannot be that abstract for the instruction of professionals. It has to be sector-specific (e.g., transport facilities and demand, capital budgeting for utilities, and planning service charges).

Why? Information technology is revolutionary in the developing world. The microcomputer is more impactful than in the developed countries because in most cases it is the first equipment available -- there was no mainframe. The Municipality of La Paz (Bolivia) got its first nine micros just lately; so far these are used mostly for salary accounting. The Planning Department of the Institute of Technology of Bandung (Indonesia) lately got its first set of micros sufficient to have an impact on instruction -- there was no computer instruction before.

Thus, these microcomputers mean explosions of new analytic possibilities -- very different ones, depending on the case. The choice is wide because the developing countries are crossroads of different planning traditions. The development of new method has no obvious course in most of them. It is essential, then, to work out what this information is to be used for, what old processes will be automated, and what many new ones will be created.

A second reality that requires local attention is that information is hard to get in most developing countries. It is held as a source of power and has to be bought with political capital. This is often forgotten by analysts in the developed world, where liberal professional ideology has substantially overcome this problem -- and cultural adaptation to the xerox machine has made information in any case hard to control. The result is that most of the larger countries have several urban and regional planning information systems at the present time, each controlled by a different government agency. The organizational arrangement for the information system is an important, difficult, and inevitably suboptimal arrangement to work out. And again, it is tied to content and cannot be concluded at the structural level.

Comment

Protecting individual rights in information systems also presents some issues requiring local attention in the developing world. The likelihood that anything resembling the U.K. Data Protection Act would be passed or honored is scant in most of the developing world. In most countries interests are accustomed to relatively low levels of disclosure on account of low levels of reporting and poor data storage. They resist interferences and would have little basis to trust a law restricting access. Note that a programme was lately terminated in Hong Kong that would have raised revenues from the use of the streets by recording automobiles' registry numbers as they passed checkpoints. This programme was cancelled in the developing world's possibly most disciplined country on the grounds that it was an invasion of privacy.

My message is that training programmes for information management must grow in good measure out of the ground of their intended use. They should target particular sectors. (It is hard to see how the Stockholm course cited could put two cases together in the same session on national debt management, and personnel/payroll administration.) Programmes need to grow out of normative intent of sectoral programmes, the prior existence and maintenance of data, professional capability available, the organizational vessel, and political feasibility. There is a strong implication that the training has to be held in the country of its use. And much depends on the teaching of "awareness" as mentioned several times in the paper. The synoptic awareness instruction must be carefully targeted, and it must be sequential, starting with the system uses most obvious to the manager and slowly raising the expectation on grip of its possibilities.

COMMENT

Ilan Salomon

At the outset the writers make an important distinction between various audiences that need to be trained, but with very different objectives and hence training tools. Senior officials and managers should not be trained to operate and use information technology (IT), but rather be educated to know what they can and should expect and how they can accommodate a productive implementation of new information technologies and processes within their organizations. Junior staff, on the other hand, require technical knowledge and again, the authors emphasize the importance of acquiring techniques which suit the environment within which the trainees will practice.

To illustrate the different training needs, the authors review a number of actual courses and workshops offered in Europe and in developing countries, and points to their strengths and weaknesses.

An often overlooked group which requires special training are the personnel who prepare and execute the abovementioned training programmes. It is often assumed that IT courses can be given as a series of professional lectures by planners and IT specialists who speak of their perspectives without a coherent integrated structure. A year-long training of trainers, as suggested in the paper, is thus highly desirable.

There are some issues which should be addressed with caution. IT, both hardware and software, are being aggressively marketed by their producers, who often offer training as part of their selling effort. The roles of supplier vs. professional public agencies in the training process need to be addressed and some guidelines to balance their benefits and costs are needed.

Another point which was not addressed is the necessary emphasis on the weaknesses and limitations of computer-based packaged models. Students emerging from short courses (more than from workshops) may be caught in a "mystique" about the planning capability of packaged models to the point where the operation of the model is seen as an end rather than a means. It is necessary to include in such training courses a section dealing with the role of professional judgement as an integral element in IT utilization in planning. This holds true in any environment, but in particular in developing countries where limited data availability may hinder the "cookbook-style" use of packaged models and where practitioners' lesser exposure to IT may affect their desire to "operate the model" rather than to acknowledge its limitations.

Comment

The training programmes suggested in the paper are necessary first steps to the introduction of IT in planning, but they are not sufficient. To increase the probability of successful and productive implementation there is a need for an ongoing and preferably on-site interaction between the trainers and trainees for a period of at least a few months. In this phase, the trainers should assume a monitoring/consulting/problem-solving role to ensure that the trainee applies the knowledge obtained in the course in a manner relevant to the context. It is important that in this phase the training be provided by well-trained trainers rather than by providers who may know the technology but much less the substance. Organizationally, this phase is complicated and costly but nevertheless, an essential element in the training process.

While the points raised above should be considered in formulating training programmes, the paper certainly accomplishes its objective in providing a very useful and illustrative starting point.

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TRAINING IN INFORMATION SYSTEMS DESIGN FOR URBAN AND REGIONAL PLANNERS IN DEVELOPING COUNTRIES

John Lindsay

INTRODUCTION

Training in information systems design (ISD) is in its infancy. Schools of computer science have trained a generation of programmers, but only now is the computer press beginning to advertise for people who can design information systems. What is information systems design? The question gets the answer, "It is something to do with computers isn't it?" or "That's payrolls isn't it?"

Information used by urban and regional planners comes from a variety of sources -- statistical, cartographic, and administrative, and planners are trained in a number of disciplines -- sociology, demography, cartography, architecture, engineering, statistics, and geography. Each of these disciplines has its own traditions of gathering data, validating it, converting the data into information, using the information for planning, and advising policymakers.

But it would take a considerable stretch of the imagination to call any of these an information system. I can cite no local or county authority in Britain which operates an integrated information system; in fact only now is the idea of a local information plan having its initial trial feasibility study being undertaken. There is no national information strategy or plan. It is not surprising that there is little training.

In this paper I have tried to give an indication of the few emerging examples which are available of the different ways in which training is being approached. I have divided it into training for clerical and technical staff, for new young professionals, for middle- and senior-level planners, and for policymakers.

Training is now the subject of a considerable literature; I have tried to avoid discussing the topic in general. The technology used in the processing of information is similarly the subject of a huge variety of journals and papers; I have tried to give simply a pointer to the changes which are most significant in the designing of information systems.

From each of their own traditions, users of information have described how they capture and organize their data. But what they now want is the integration of the information resources of an urban or regional government into a system. That requires information planning.

The questions which remain unanswered in this paper are, firstly, whether it is better to take planners and try to teach them how to design and implement information systems for the process of planning, or whether a thorough grounding in computer science is the essential starting point; secondly, which part of the governmental structure should provide the lead in the coordination of information planning?

My general conclusion is that we do not have enough experience to be able to draw any general conclusion. We are still at the level of innovation so that the idiosyncracies of the particular situation make it difficult to generalize.

What we have to try to get away from is the pattern whereby each type of information user describes his tradition as the information system.

We also have to make clearer that information systems are part of the political process, not something standing above it. Information is part of the jostling for power and influence within institutions, and part of the process by which the propertyless are kept in their condition.

But designing an information system can help to make clear the absurdities of bureaucratic procedures. It is to awaken that desire that training should be directed.

INFORMATION SYSTEMS AND THEIR USERS

A recent book, edited by England and others, summarizes current practice in Britain on information systems for local government. They show each of the different parts of government from which information is generated, and how each part of local government has organized its information. Even more recently, in May 1985, the papers of the computers in planning conference, dealing with development control systems show the central issues of concern to British planners.

Each of these also shows the specific nature of the problems facing British planners -- an antagonism between central government and local government, severe restrictions on public spending, and a drive to open to competition and profitability social provisions which had previously been seen as public services. During this time rather than be concerned simply with physical planning, the town planners have been forced to take into account the wholesale destruction of jobs and examine the planning of the whole community under the influence of the argument that the marketplace is the only effective planner.

Their need for information and the types of information system which will satisfy those needs must therefore change. The British Urban and Regional Information Systems Association (BURISA) Newsletter, now at number 72, has chronicled this shift in need and given rich evidence of how planners have responded.

Nor do I think it is a purely British phenomenon, though the details might vary. The recent international conference in Toronto organized by the Urban and Regional Information Systems Association (URISA) addressed these questions as did the Organisation for Economic Co-operation and Development (OECD) work on urban change. In developing countries the rate of change is that much greater, the resources available that much slimmer, the need that much greater.

There have been a number of inventories of information available for government of one type or another. Salmona and Man are two examples. There does tend to be a separation between documentary, cartographic, and statistical information, but this reflects historic experience. It is only with the development of integrated packages that the point of linking different data types becomes clear.

The method for designing information systems which I support starts with constructing the information map, the identification of all significant information sources. Training requires the preparation of material for the identification of these sources and the methods by which the information can be gathered.

As national or local information plans are rare, the preparation of the information map requires negotiating a political minefield in which the local peculiarities preclude prescription. In turn it is insufficient simply to identify sources; the planner must be able to form an opinion of their verity.

Although a number of papers have covered in varying detail many of the issues involved in dealing with these different sources of data, because I want to look at how the planner must attempt either to integrate them or draw on them, I summarize here some which I think are relevant.

Demographic Data

After the master plan, finely printed and bound, which planners on my course identify as their information source, the next most frequently remembered is the census. The practice of taking a decennial census is common in most parts of the world, though the results will vary enormously in reliability and speed with which they become available. To plan with data gathered once every ten years, the published tables for which appear five years after the data was gathered, is a fraught exercise. This is particularly true as units of measurement, administrative boundaries, and definition of category are continually changed. This is not peculiar to developing countries. England's book spends quite some time on methods used to provide more accurate data than the census.

The rate of change of population distribution through migration and mortality render much of the data useless. However, new technology means that if only census data can be accessed at the right time and in the right place its use to planners can be increased. Knowing what to ask for and where to ask is one of the issues with which training in information systems design must deal.

Training the census planners would help. But that must be the issue of a different paper.

Economic Data

Central banks maintain data about currency and imports/exports. Customs departments collect facts at border posts. Ministries of Economic Development or Planning Commissions keep data. This data, though, is usually collected for a national entity. Within a country there is usually no spatial component so information about a city or region cannot be gleaned.

Chadwick-Healey, a publishing company, has made available on microfiche the annual reports of the world's central banks as collected by the International Monetary Fund (IMF) in Washington, which at the level of planning of the supra-national region might be useful, as it might for comparative work. The Industrial and Technological Information Bank (INTIB) data base of the United Nations Industrial Development Organization (UNIDO), and particularly the work they are doing on historically correcting data on the basis of correlating evidence, is worth drawing attention to.

Also interesting is the work of the British Central Statistical Office which is providing monthly and quarterly statistical data on floppy discs.

Economic data from taxation records, even if planners could gain access to it, would be of doubtful use. The level of illegal economic activity and the extent of the informal sector both make any attempt at gathering information an exercise which requires much questioning of presumptions during training at all levels. Cultural presuppositions on questions, such as female headed households, show planners at times to be so blinkered that training in information systems design has to include a much wider syllabus to make clear the hidden curriculum within which they usually operate.

Microeconomic studies can provide fruitful evidence. In the section on information sources I refer to the need for better integration of information services. Correlating the results of micro studies with macro information systems is an aspect of training and of information systems design which bureaucratic compartmentalization has made difficult. Getting the planner to reflect on his private life, his own day-to-day experience of his relatives and family, is a useful antidote to some of the more extreme reliances which are placed on economic information. This, too, should be introduced into training programmes.

Housing

Housing surveys and housing needs surveys are legion. Often, though, they ask questions at a level of detail which makes the exercise so expensive that no money is left for plan implementation; or, at a level of generality that no useful conclusions can be drawn. Failure to document leads to wasted resources. Lack of stable reference points weakens useful comparability. Where the rate of change is great, the value of uncoordinated snapshots must be queried.

The survey is also an intervention into the life of those surveyed. Experience from the fields of community participation and gender-aware planning needs to be structured into training in information systems, particularly awareness of the informal information system.

Every survey will have its value increased if it can complement the building of the planner's information system and if resources are allocated for this sort of work. The element of the design process has little exemplary material on which to draw, but that is no reason for not underlining its importance.

We need also to consider the organization of housing tax and housing finance. Much work has been done on methods of recovery and rates of return, but less on recognizing that these programmes are a source of data for policy and planning. It is possibly worth making here the general point that an information system, the real function of which is the improvement of policy, will be more likely to get off (or even onto) the drawing board, if it can be shown to be capable of paying for itself. Packages like that of the United Nations Centre for Human Settlements (Habitat) can generate data which in turn can inform the planning process. The integration of these parts into the information systems design requires training in both knowledge of what is available and in how to make these compatible.

There are particular difficulties with the data collected by Housing Banks and Housing Finance Corporations, where they are separate from local authorities or government. The extensive networks of local agents which they require, though, make them a valuable resource.

Land/Property Registration and Cadastral Surveys

The emerging stability of an area can in part be measured by the detail and accuracy of its land registration. The International Institute for Aerospace Survey and Earth Sciences (ITC) in the Netherlands has put considerable resources into training planners in the techniques of cadastral surveys and the setting up of land registration data bases.

Developments in remote sensing are changing the economics of data collection on large-scale areas. Digitized mapping provides another element of the integrated planning information system. Training in surveying techniques and cadastres has possibly been too separated from training planners. This is an area where training in the integrative elements of ISD will be most needed.

The most difficult part is the setting of proper levels of sophistication in areas of very fast change or areas where attempts to alter patterns of land tenure will be perceived in the setting up of an information system. Training needs to pay as much attention to the political issues as the design issue, and the design has to be sensitive to the structural questions rather than simply the technical ones.

Transport

Planning and monitoring transportation systems has traditionally been an extremely expensive and extensively documented exercise. There are also wide varieties of computer-based techniques and applications, including those for microcomputers.

However, the separation of road from rail, sea, and air at government level and within the industry has not led to a practice of monitoring transportation as an integrated system. The fault lines are considerable. Further, the antithesis of public and private transport, irrespective of the suitability of a particular mode for that economy, has bedevilled attempts at integrated planning.

The separation of transport planning authorities from other aspects of general planning has led to further fault lines.

Many of these faults have been replicated in developing countries, accentuated by the scale of the problem. Training in transportation information systems needs not only to be sensitized to arguments within transport planning about appropriate transport systems, but about the integrative aspects of planning information.

Interesting work in Australia has shown how the combination of a digitized map data base can make traffic surveying, for example, much more simple and cheaper, using colour and microcomputers. Digitized mapping, along with traffic patterns, in turn, feeds into land use policy decision support systems.

Information transportation rather than people or goods transportation is a factor which technical changes are making more important. Training in ISD needs to place increasing importance on the economics of the complexities of these choices.

Telecommunications

Telecommunications is usually provided by a central or national body, despite so-called market forces or privatization. It is also only now being recognized for its full economic implications and entering national planning processes. Within urban areas the telecommunications aspects of network planning as well as node and line location factors need to be taken into account. The enormous level of technical detail which has to be grasped makes the communications aspects of ISD difficult for the noncommunications expert.

However, digitized data flows, optical fibre, satellites, and open systems interconnexion (OSI) seven-level standardization have the potential to change the economics of information transportation significantly, which increases the importance for both general planning and administration method and for ISD. The temptation to say that these advanced technical issues have no place in developing countries must be resisted. The difficulty in training information scientists and engineers in the communications aspects has to be overcome.

Energy and Power

The provision of these facilities is again often the responsibility of other authorities than either the urban planners or the regional planners. However, the data bases which these bodies are capable of setting up, the economic consequences of not integrating the information component, and the real practical difficulties experienced in many older cities ought to provide proof of the importance to be attributed to paying proper attention to this. In addition, the thorough monitoring which follows from the consumption of and repayment on information generated can provide important datasets for more general monitoring and planning.

Training the administrators and planners of the energy or utility suppliers seldom takes into account the more general urban or regional planning implications, and change in this area is likely to prove difficult. However, training the urban and regional planners in how to influence the design exercises of these authorities has more hope of success if backed up at the right political level.

Education

If primary and secondary education planning is the responsibility of the local authority, then data here provides potentially two functions, in the planning of education provision itself and in the provision of check data on other operations.

The proportion of children actually undertaking education is liable to distortion as is the monitoring of success, but this data can be compared with demographic and employment figures.

Tertiary education frequently falls to the responsibility of other authorities, which raises again the planning necessary for the implementation of the information system. Where the primary and secondary school system has been developed to cover a significant proportion of the population, then the institutional base exists for local-level data collection which could prove invaluable, allowing also for a more stable time series than other data sources.

Health

Health planning is usually the responsibility of another ministry or authority. Much data might well be collected and maintained, but manual case load information handling makes aggregation to the level useful for health planning, never mind more general planning, difficult. Technical developments are opening up possibilities here, which could provide useful checks on demographic data and projection series, while potential epidemiological data could prove invaluable.

The role of the urban or regional planner in disaster planning makes an argument why health data ought to be made available, which can help to overcome the resistance of the health authorities to another outside information requirement.

Water

Monitoring water consumption and planning settlements with the availability of water has not been traditionally one of the functions of local planning in Europe. Discussion of general information systems makes no mention of water supply.

However, in developing cities the availability and cost of water supply is crucial. Data generated from monitoring of water availability and consumption patterns needs to be accessible to the planning authority. There are a number of methods whereby this can be done easily and cheaply. Implementation of systems which appear to change the pattern of charging or the costs of water are likely, however, to meet resistance.

Food and Supplies

The movement of goods into and out of cities, their impacts on the areas of food supply, and the planning of urban areas relative to the availability of areas to sustain them implies the organization of bodies of data which appear remarkably lacking in the literature.

I have remarked already how the national focus of trade data makes it difficult to understand the development of local economies. Without this level of information, though, planning becomes guesswork. The work of the Greater London Council (GLC) has shown something of what can be done in this area.

Waste Disposal

Here is another aspect of the essential function of local government from which data can be gathered, at least to check other aspects, apart from the essential data for the planning of the operation itself.

The most interesting information systems design questions, though, are probably properly part of administration rather than planning.

Police

Police information systems are probably better left out of this survey altogether as they raise questions of such enormity that insurmountable difficulty arises. The attempt in Britain to make local authority planners in part responsible for civil disturbance planning after a nuclear holocaust has put these issues clearly on the agenda. The training of planners in information systems design needs to pay more attention to these matters.

The Varieties of Users

In discussing training in information systems design, we have to distinguish between national-level, regional-level, metropolitan-level, large city-level, and small and medium town-level planning. Though rural planning is outside the brief of this paper, the relationship between town and country is so closely interwoven that I would like to suggest a continuum. In any case, much of the data required for regional planning, and much of the data required for planning within a city, requires information about the surrounding areas such that eliminating rural areas will simply create an unhelpful gap.

The planners will come from a variety of backgrounds and professional traditions -- statisticians, geographers, economists, architects, accountants, librarians, and lawyers. It depends on the particular local situation whether the intention is to train the planner in information systems design, or take information engineers and introduce them to planning, or better to define the training tasks to produce the information system planner. The strengths and weaknesses of the environment must form the foundation on which these decisions are built.

Each of these disciplines has its own traditions. We can see here another value of technical change. Computerization is throwing up all sorts of new techniques and is blurring boundaries. It is building up an institutional insecurity that is capable of weaning people from professional traditions, picked up in the developed world, with long traditions of specification and division of labour unsuited to more fragile economies.

Coordination of Development

Within the multiplicity of agencies of any human settlement there is an enormous amount of data. Every time an activity takes place it draws on the data of the past and changes it. There is a value in planning the organization and supply of information as well as planning and administering the organization. However, institutional jealousy and the recognition of the power which comes from processing information means a war of position fought among its hoarders, which is a continual drain on the resources of the area. Training of systems designers needs to be able to move to the highest level of political abstraction to understand the management of complexity as well as down to the most basic level of technicality.

Planning or the Market?

The argument has been raised that the market is the best mechanism for a general planning strategy, which has resulted in a sustained attack on the planning profession. In turn, the argument has been raised that information, like anything else, is a marketable commodity, and only that for which demand has created the conditions by which a profit can be generated needs to exist.

Many Western aid agencies are increasingly emphasizing the importance of privatization. This is an issue which training in systems method needs to address.

The Limit of "Developing"

Although this article seeks to give attention to the specificity of planning information systems in developing countries, it is worth remarking that this is no homogenous grouping. Within and between countries there is more differentiation than between the group called developing and the group called developed. In many areas and institutions of the so-called developed world there is as much shortage of skill, equipment, and clarity of purpose as anywhere in the developing world, and in certain institutions within the developing world there is clearly no shortage of resources.

What is probably worth noting, though, is the shortage of infrastructure so that faults are difficult to rectify, and the shortage of skilled manpower, so that the team combination of skills which needs to be built up is easily destroyed if one key member is lost.

Information for Whom?

It is also worth noting at this stage that information is not some undifferentiated good which simply has to be better organized. It is a question of power and the organization of surplus within the economy. It is a question of the organization and administration of class-based societies where competition among bureaucracies and among classes is the normal, not the exceptional, order of things.

The apparently incomprehensible failure of systems is not simply a matter of design; their purpose masks incompatibilities which are not often clear to the designer.

The improvement of a system of collecting repayments on housing loans, more effective administration of an IMF loan, and improved statistical data base on the informal sector are not simply technical matters; they are mechanisms for the relocation of resources. As such, they will meet resistance and opposition.

TECHNICAL ADVANCES

I do not want to describe the technical changes which I think are the driving force which has enabled us to reopen discussion on information systems design, as I presume readers of this article will be aware of them. All I wish to do in this section is a checklist of the issues which I think are relevant. However, the powerful combination of microcomputing, commercially available software, and telecommunications developments are I think only partially understood by information systems designers, and developing an awareness of these facilities among development planners must be the central issue to which training addresses itself.

There are six areas within which we can discuss the new technologies. Each of them has a large range of commercially available software and some considerable experience of applications has by now been written up. I would argue against trying to develop in-house systems from scratch until all the options these present has been tried. Indeed, I would go further and suggest that if current procedures do not quite fit easily into a standard package, then it is better to change the procedures rather than write new software.

Data Base Management Systems (DBMS)

What is usually meant by a DBMS is the software which allows a set of data to be managed in a particular way. A library catalogue is probably the simplest way of grasping the idea, but rather than just the author and subject listings which would previously have been managed with cards, you could sort into a new order, search for a particular term, insert a new entry into the right place, and print out a selective bibliography, all from the same data, only entered once. You can, in other words, set up relationships among data which previously could be only sequential or hierarchical.

The best known microcomputer based relational DBMS package is probably dBase II, for which there is now an extensive literature. It will run on almost any machine running CP/M, and work in Britain on the Proteus project has successfully moved data on one site in dBase II into a data base set up on INGRES (a UNIX based system) on another site through a network.

In turn dBase files can be moved into Wordstar or other word processing package for the preparation of reports. It also contains a count facility, boolean operators, and basic arithmetical ability.

The important point here is that the skill lies in setting up the data structure, in other words analysing the objectives of the institution and the information flows within it, so that ideally any piece of information (a datum) is entered into the system only once in its history.

In Britain, though, the reality of data acquisition tells rather a different story.

The Business Statistics Office within the Department of Trade and Statistics has used the method on about thirty data entities covering all British companies to upgrade their facilities from punchcard to interactive searchable data base, publishing data in a variety of media. This economic data can then be bought by planning authorities.

Industrial Markets Location surveys annually all industrial properties and builds up a data base from which it can then answer specific questions, or provide output. The Greater London Council buys this data to use as the basis of its planning operation on economic activity.

At the other end of the scale, Hackney Borough Council uses a small software package on a microcomputer to store annually recorded data on 35,000 economic activities which take place within the borough. Three surveyors cover the entire area annually.

What is missing in these examples is any indication of the planning of information systems, the practice is rather an *ad hoc* acquiring, by different methods for immediate short-term purposes, whatever will best do. In the first case the data is provided for a market by the central government, in the second by the private sector, in the third it is collected and entered in-house.

Geospatial Data Systems

A geospatial data system is a particular type of data base, where the data consists of digital representations of surfaces. The British Government Ordnance Survey is engaged in an exercise to digitize the entire Ordnance Survey Map series. At the other end of the spectrum, with a digitizing board costing a few pounds and a plotter, one can digitize one's own maps. The expensive part of the operation is the time involved in digitizing. Building up a data base of maps already digitized, their scales, types, and areas, so that this data can be transferred into a new application is one of the simple, money-saving exercises which never seems to get done.

An alternative to digitizing is to buy in digital data from a remotely sensed survey. Aerial photography can be done from an aeroplane or a satellite and gives a picture; digitized it gives data which can be read into another computer and have operations performed on it. The cost of aerial photography versus buying tapes from Landsat, for example, is a question of the cost of the survey, not the technology.

Once the digitized data base exists, the interesting exercise then is how to give a spatial component to economic or demographic data. Microplot, developed by Ian Bracken of the University of Wales Institute of Science and Technology (UWIST) is a microcomputer based system, written in Basic which will enable data to be taken from say a dBase II file into the digitized polygons. Mapics is a similar but more powerful implementation running on a minicomputer, developed at the University College London (UCL), which has been used, among other places, in the planning of Mecca.

Statistical Data and its Uses

Statistical data bases are again a particular type of data base in which the data can come from any source. They, too, now have an easily available software package associated with them -- the spreadsheet. By setting up a large accountant's book with an open page, the columns and rows can take data from a data base and allow one to perform a series of calculations then print them out or share them. Lotus 1-2-3 is probably the best known and most easily available of these.

The most extensive set of statistical data will arise from the decennial census. An interesting development here is that the 1981 data is available down to the level of an enumeration district (ED) (about 250 people). The data for any defined ED, or aggregation can then be bought. A software package such as the Small Area Survey Package (SASPAC), developed by the Local Authorities Management Services Advisory Committee (LAMSAC), will then allow one to set up a query language. In turn, this data can be moved into a large-scale DBMS like the Statistical Information Retrieval System (SIR) or the Statistical Package for the Social Sciences (SPSS), both of which are now available in microcomputer versions, so that calculations can then be performed without the full backup of a computer centre.

This data is held on tape within a number of data archives so that one can either buy the parts one wants on tape or disc, or search the data interactively and download to disc the sections one wants. The local authority has access to the disaggregated data already in digitized form, where previously it would have had data available only in printed form (which would have to be keyed in), and at a level that it can read it into one of the geospatial packages so that it can work on areas as small as a block.

The National Algorithm Library makes available a large number of routines which will allow one to perform extremely sophisticated statistical operations on data. The need for high-level skilled statistical computation experts is removed.

The Central Statistical Office will, in addition, provide monthly tapes of data which have now been worked on by the Economic and Social Research Council (ESRC) Centre for Economic Computing so that 600 of the main datafields may be bought on a floppy disc to run on a personal computer. This will include economic data from most of the main government sources -- financial, imports/exports, employment, and so forth.

Graphics

Most personal computers now have available packages which will allow one to draw screen layouts, sometimes as part of integrated packages such as Jazz (which integrates word processing, data management, graphics, and communications), and on mainframes there are sophisticated integrated libraries of routines such as Gino (which has graphics capabilities). Statistical data can be transformed into graphs, charts can be integrated into reports, colour terminals and four-pen plotters will allow one to produce colour output. Three dimensional rotational packages will allow one to map, for example, the movement across a building of the sun by time of day, so that shadow optimalization can play a part in window design. In turn, libraries of building design parts, related to a data base of materials available and their costs can cut the draughtsmanship required to produce a building or a site.

Management Information Systems (MIS)

This type of software package now pulls together the others I have mentioned before and integrates them into a single system. Framework and Symphony are two of the better known which provide the basic software. On the data, one can then perform a series of "what if" calculations, make projections, and begin to plan. Some packages have taken the basic skeleton and then worked out a series of applications such as payroll, project planning, income-expenditure, and so forth. The general point to be made is that the further the package has gone towards being user-friendly, the less adaptable it will be.

For the packages marketed as planning tools, I think the general point can be made that the more simple the tool is to use, the more simple the view of the world it represents, such that the question must be raised whether it really is of any practical use at all. The more complicated the view of the world -- the British Treasury Economic Model, for example, with more than 300 variables in the matrix -- the greater the sophistication of the department required to run it. And even then, for reasons indicated earlier, there is considerable doubt about the benefits to be gained in understanding from the exercise.

In discussing these management tools, there is a query on the relationship between the operational aspects of a function, its management, and the planning function. The Local Authority Management Information System (LAMIS) is an integrated local authority planning tool developed in Britain, yet if it functions with a land use data base, a property data base, and a population data base, then it is as much a matter of processing planning applications as using the aggregated data for showing trends.

Decision support systems, expert systems, and intelligent knowledge-based systems can be seen as developments of the basic idea of a management information system, where increasing sophistication is built into the software design in order to either improve the capacity of the manager, or allow for increasing the skill levels of operators.

Communications and Networking

The old complaint about the incompatibility of computers has been changed markedly by the development of a range of communication devices. The Kermit library, for example, will allow one to move a file from any micro for which it has been developed to any mainframe on which it is running. Terminal emulators will allow one to use a micro as a terminal to a mainframe. Networking communications software will allow one to move files from one machine to another over the ordinary telephone network usually called the Public Switched Telephone Network (PSTN), over digital data networks, in the public domain usually called the Packet Switched System (PSS) network, over internationally privately-leased lines, such as the IBM Network, by optical fibre, by satellite, or by any combination of these. Data can, of course, still be copied onto a disc and popped in the post.

The advantage here is that one can develop the level of computing power adequate to one's immediate purpose, but the main data store can be accessed when the data is required. Electronic messaging allows one to then share files, set up meetings, and maintain diaries. Experience is that all this leads to an increase in the amount of paper following, not a reduction.

It does not take much imagination to see the scope for a planning department processing the planning applications, the bread and butter of local authority administration.

Summary

I have not gone into any detail in this section on the ranges of software available; I simply indicated the orders of magnitude. Directories of available material are now commonplace. An interesting exercise is being undertaken by the World Bank, of spinning public domain software broadcast through a satellite network, which may then be downloaded by any public sector body in the third world wanting and able to make use of it.

What I am asserting here is that with the vast options that are easily available, off-the-shelf softwares should be able to satisfy most reasonable demands without skilled computer programmers. It does mean, though, that the planners have to have a particular type of training.

WHERE CAN INFORMATION COME FROM?

We now need to move to developments in some of the methods of collecting and organizing information. I have already indicated the importance of mapping the existing data sources. Most of these will be ongoing (though an oft-noted characteristic of work in developing countries is the lack of continuity, to which aid agencies contribute by their project funding methods), so it is important to set up the mechanism whereby the data can be made as compatible as possible to the widest range of users. These will include maps, archives, very important and badly documented sources such as pipe, drain, and supply routes, and surveys.

Information is more than data. Data can come from many sources in a wide variety of formats. To be turned into information it must be purpose-oriented.

There will always be projects, though, for which data will be unavailable and have to be collected from scratch. Questionnaire survey, sample survey, and interview, all standard techniques within the social sciences, are extremely expensive and need to be written into a project with great care. Training needs to point to the dangers of the temptation to hold back on a project on the grounds that there "isn't enough information," which must be resisted. There is never enough data; the question is whether one can get by. Any exercise in the collection of new data must follow a thorough analysis of everything available and a clear costing of the exercise within the project.

A source of material frequently ignored is the Ph.D. literature in the local university and the fieldwork done by U.S. or European students. American Ph.D. literature is easily accessible on "Dissertations Abstracts Online," and the University of Michigan publishes free the subject and geographic catalogues from which texts may be ordered on microfilm for US$19. British and European material is not available as easily, though there are a series of projects working on this.

Material from projects which does not get as far as a fully written up thesis might still reach the level of a journal article. Even newspaper articles can contain information of use. The work of the GLC in setting up a research and intelligence section broke new ground in Britain, now being repeated in a number of other local authorities. I have already remarked on the unavailability of subnational data and the limitation this places on the work of the urban or regional planner.

In the case of the GLC the work went even further when it found that spinning its data base drew too great a contribution from its computer facilities: The next stage it went to involved spinning its data base, now called "Acompline," on the European Space Agency host. Finding that it was having to pay increasingly to make use of its own data, it undertook the task of reformatting data from ISIS to STAIRS and, with the upgrading of the GLC computer facility, in turn, being able to spin it in London and provide a free information system to the contributing boroughs as well as their own officers. The information system then went through three phases, in the process becoming the major organization of published and unpublished documentation on local government in Britain and probably in the world.

Data bases of ongoing projects need to be built up as a matter of urgency and as documentation centres of project material, so that the benefits gained from previous experiences are not lost. Indeed this argument can be taken further. Until one can adequately document ongoing projects, the allocation of new money cannot be measured against value gained from previous expenditure. In turn, the point I made earlier about information for policy growing from information with an immediate value return, indicates that from project management systems can be aggregated the data for planning application with no increased cost. As many projects are, in turn, funded by aid agencies, either bilateral or involving United Nations (UN) type organizations, which will maintain their own information systems, these bodies should be looked to as sources of data. The United Nations Development Programme project management system should be looked to and I would like to draw attention to the work of the Advisory Committee for the Co-ordination of Information Systems (ACCIS), UN Register of Development Activities and its newsletter for information on improvements in the general UN information scene.

It is also worth drawing attention to the Kenyan Government data base, Compendium of Development Projects in Kenya, produced by the Ministry of Finance using what looks very much like Lotus 1-2-3.

The wide range of research facilities undertaken by university departments of development studies and so forth are underutilized. Indeed, one might make the remark that a characteristic of developing countries is the lack of integration of the information infrastructure. Training planners in the nature of the information market is an important component.

Codes of practice, international standards, and testing of materials are important information sources for which wide international networks now exist and regional or national networks such as the African Regional Standards Organisation (ARSO) are developing. It has long been recognized that unsuitable standards and codes of practice are an impediment to developing human settlements, yet planning departments often appear ignorant of work in this field.

Brenda White's work of 1974 still remains the most comprehensive introduction to data sources, though now sadly out of date. Surveys and studies have been done in a number of other countries, including those by Conroy and Donaldson. Surveys of information sources, project documentation, thesis literature, working papers, and so forth are being developed for a number of countries and regions. Extensive searches on a range of data bases indicates the weakness of organization of documentation, in which there is much scope for improvement at little cost.

Who is responsible for organizing the training of the planners who are going to set up this part of the information infrastructure? The

World Information System for Science and Technology (UNISIST) principle has established the idea of the national centre for science and technology. A number of these now exist in developing countries. But there is little evidence that they provide a research facility for planners, even though their directors have in general accepted that social science is a proper part of their activity.

It is clear that planning departments are badly supplied with documentation centres; links with national statistical centres, surveys, and computing centres are weak or nonexistent, as are links between ministries where the interests I have been discussing overlap. The strategy of a local information plan has much to commend it. Until we have trained the information systems designers, however, we are without chicken or egg.

TRAINING OF CLERICAL AND TECHNICAL WORKERS

Having outlined the method of information systems design, the range of information and the technical changes, and the sources of information, we need now to address some of the questions about how training can best be conducted.

I start with the layer generally ignored -- the clerical workers -- for two reasons. If their willing participation has not been won to the development of a new information system design, then it will fail. The wide variety of methods of putting a spanner in the works, by clerical workers who have over many years established working patterns in which they have a control over their conditions, are now recognized as an integral part of managing systems development. It is only when they understand the benefits to them of an improvement in their working environment that they will cooperate.

In addition, in areas of high unemployment where the job security of the public sector is something which has been won at considerable cost, they will fight to protect that position. In Britain it was only by regrading all clerical workers in a department of the civil service as data processors that their compliance was won. Where the civil service is particularly protected or recruitment into it brings particular benefits, any threat to their employment will be resisted.

The second reason is that they must understand the trajectory of the project. To regard them simply as keypunchers is to lose the contribution which they can make, and to fail to prepare them to make decisions during the implementation phase. At the most simple level, attempts to introduce Taylorist management practices remove the error checking device which a conscious human provides over the blind keyboarding by piecework payment.

Training must commence during the design phase. The initial survey and "Delphi technique" period must include a representative sample of these grades, and, if unionized, their representatives. The training, regrading, and working conditions for the implementation phase need to be worked out now and included in the project budget.

Information systems design, at least in Britain, frequently cuts across the traditional departmentalization of planning institutions as well as the division of labour. Responsibilities between clerical and professional grades become blurred, or break down. Training must therefore include sessions on the aims of the operation, expectations, objectives, stage by stage, and evaluation. Where new skills will be required (e.g., digitizing, keyboarding, running short application programmes, responsibility for maintainance, and so forth), training components need to be draughted and budgeted for. Most of this training can be done in-house, though there is a distinct benefit in taking people away from their environment, either to a training centre, or to an application which is already working. If the clerical staff can discuss and meet with others who have been part of a successful installation, this will be helpful.

It is also important to bear in mind that during the implementation phase some of the people might well show an application for this sort of work. It is important to ensure that no structural impediments exist to prevent them from moving onto professional grades and engaging in the next level of training.

During the design stages the budgeting for training has to be allowed for. The increase in workload during the transition period must also be taken into account.

Not only does one have to deal with the training of these grades of workers, but the professional information system designer needs to be trained to take these issues into account, as must the cost of entering data and of running the established system in parallel.

TRAINING FOR NEW YOUNG PROFESSIONALS

The training here needs to be seen in two parts: Those who are still undergoing undergraduate or postgraduate education, and those who have recently qualified, say in the past five years.

There are two sides of the field of training which need to be taken into account:

(a) the contribution of information systems design in a conventional training for a particular discipline; and

(b) training of professionals in information systems design.

There is, I think, an argument to be made, that professional training at this stage has taken on too deeply the division of labour which is the practice in the developed countries. Courses in a variety of disciplines from which planners are drawn need to have components introduced into them, which include the principles of ISD, project method, and elements of information technology; in other words, the bulk of what I have dealt with in the earlier part of the article.

For architects, some of the computer-aided design (CAD) and management information system are beginning to appear already in Britain. Yet, I suspect that the amounts of money involved in big practices means that university training lags behind the most advanced practice. It is likely that Western construction companies which win projects in the third world will be providing expatriate practitioners more acquainted with the new technologies; hence, the divisions of experience are going to widen. Micro based versions tend to be too simplistic in their modeling capabilities to be of real use.

For geographers, the use of remote sensing, computerized demographic studies, MIS, computerized cartography, and similar parts of the field are also emerging. For economists and the general social scientists, too, they are likely to be introduced to the current levels of computer training, at least at the level of dealing with statistics.

Engineering as a discipline has a wide range of computational tools which are increasingly easily available, including at the design and project management level as well as calculation.

Experience in Britain has indicated that people who come from a computer background are themselves inadequately prepared to teach the applications which might be useful in policy and planning or administration. They are too technology-centred and concerned with theoretical niceties which do not take into account the practical operating environments of the users. There is not yet the richness of experience necessary to release the practitioners who have been designing the systems and implementing them for long periods to train a new generation. Most reliance has to be placed on the current teachers from the backgrounds of the traditional disciplines, but here the danger is that they are the ones who have the most to lose by the new technologies and will be reluctant to make the change. Retraining this layer is probably best dealt with by considering them as senior planners.

In turn, it is very difficult to give people whose initial training is in computer science or data processing the skill which is required to become information engineers. There seems to be in Britain a real difference in attitude or temperament between those who follow a technical bent and those who have a more social bent. Without wanting to plunge into kitchen sink psychology, more work needs to be done, both comparatively internationally and interdisciplinarily to try and pinpoint causes and transferability of this characteristic.

I do not want to go into great detail on syllabus or curriculum with this level of training; these questions are being considered by the bodies responsible for each of the disciplines and I think the divisions are still too great for any generalized practice to have appeared. I would suggest that it is unsuitable to introduce "computer science" or "programming" into a social science background; but it is extremely important to cover the questions I have discussed in the earlier part of this article. On the other hand, I think it is essential to introduce "information systems environments" into computer science courses.

It is almost certainly too early to talk about undergraduate or immediate postgraduate-level training in information systems design as a subject in itself in most developing countries; there are still very few such courses in Britain. Just as it is unclear that there is a discipline called "planning" and there are few undergraduate courses aimed at producing "planners"; so a quandary exists whether ISD should properly be a course in itself. Crudely put, the quandary is that if the training is at too great a level of detail no sense of system emerges, only a technician; if at too great a level of generality, the system disappears, all that remains is a vague electicism. A valuable exercise would be a much more thorough piece of work on developments current in Europe and North America to monitor opinion as information engineering becomes more established.

I have discussed in some detail, the next level of training, the master's level, in the section on advanced training for senior planners. If the first degree deals with broad education, then the second degree needs to be the time when vocational training is introduced. There is a certain qualification inflation which has led to this being the case. There is a very strong argument for as much of this as possible being conducted with work experience.

A further area of training is Ph.D. level research. There would be some opposition to considering this training at all and it opens a topic which it is not the province of this article to discuss: The agenda for research in the field. That requires a paper devoted to the topic itself. For some years, however, Ph.Ds. in information systems design for planners at the regional and urban field have appeared, both dealing with particular developing countries and by students from developing countries, as well as studies from the developed countries, which raise questions of relevance. It is usually only at this stage in a career that the number of years necessary can be devoted to a research project. There is room for considerable argument, though, both that a young professional cannot afford to spend this amount of time away from practice and that this level of "training" ought not to be able to consume scarce resources.

Yet, without the building up of a cadre of professionals who have had the depth of study which this level allows, it will not be possible to develop the in-country facility which is required for lower-level training.

I do not want to deal with this question in detail; it is a matter for a much more general paper on training in developing countries with nothing specific to planning; I merely want to indicate that the question exists and needs to be taken into account. The UNCHS (Habitat) has been supporting a project to investigate the training of human settlements planners, to which I would draw attention.

During the early years of practice, the new young professional needs further in-service training. What is emerging in Britain is a process sometimes called a thick sandwich. A couple of years of full-time university-level education are followed by a year in a workplace, then another year at university, followed by a couple of years of workplace experience leading to a professional qualification.

Training in information systems design could, I feel, benefit from this sort of package. People at work get the advantage of seeing in practice what the job is like, the workplace gets the benefit of experience of new ideas. This requires a high level of cooperation and coordination between the training institution and the employing authority, which might not be the practice within a particular country. Experience in Britain indicates that it takes a considerable effort to make it work. There are also considerable historic impediments in the traditions of what comprises a university education which would require considerable organizational change.

External support for a project developing training facilities of this sort might well be necessary. The World Bank funded project in which UCL cooperated with the Institute of Technology Bandung (ITB) in the setting up of an M.Sc. course in regional planning might be a pattern for aid work to take in this field.

These types of undergraduate and postgraduate training, in turn, lead to questions of the availability of equipment, both hardware and software, and to access to suitable datasets. The planning of an infrastructure within which training can take place needs to be part of the planning process and aid projects involving a planning component should take this into account.

This discussion of training for the young professional needs to consider also the paraprofessional, those grades above the technical but below university level.

Training in general at this level is difficult to discuss. There are so many variables which have to be taken into account. This level could include "barefoot planners," local leaders, or activists who have been incorporated into an administration or community participation exercise where they are involved in the collecting of information and its inclusion in the planning process by those implementing a system. I think we can safely say, though, that these people will be unlikely to be involved in the design other than as participants and they are unlikely to be taking a role in initiating training.

For all grades at this level of their professional careers, there is no longer the need to take them away from their home country for training. However, the building of adequate departmental facilities in-country can properly be considered as a need. M.Sc. and Ph.D. level students will certainly want to travel. In many cases they do this at their own expense. I feel that this level of training is better provided to mature practitioners when coming out of the public purse.

MIDDLE- AND SENIOR-LEVEL PLANNERS

We are now on more solid ground. There is some experience on which we can draw. Third world practitioners have been trained as part of aid programmes for many years. There has been much research into proper, suitable, and appropriate training as well as a critical literature on practice, and I have referred already to UNCHS (Habitat) work in this field. There is now also the experience of the past twenty years' work on ISD for policy and planning in the developed world, though there is not yet I think an adequate body of evaluation.

Just as the earlier part of my article dealt, in turn, with information systems that exist, then the implications of the new technology, then the sources of information, I would like to suggest that training should be outlined in the same way: A look at how things are done now; the technical changes which are taking place; and information systems as they could be designed. However, I fear that in practice much greater prominence will be given to the technical component.

We need to consider the issue in two parts: What should be the content of training, and in what form is it best conducted? I would suggest that the content required is the taking of experienced practitioners who have grown up in a particular tradition and discipline, in particular institutions, operating in specific ways, and pulling them back in order to gain a general picture of the actual results of their practice. This can be best conducted by taking them from their normal operating environment and letting them see how things are done somewhere else. From this, they get the chance both to ask why it is done in this way here, and why they do it in that way there.

But often what they desire from training is a new technical competence, plus the cadre-point of having studied overseas. To produce the change in attitude is seen as introducing material which has an irrelevance to the detail of practice. We then must be trying to do two things at once: To give the improved technical competence but also the perspective which indicates why the previous "proper" technical competence which was part of their initial training is now no longer adequate. This they will perceive through the experience of technical change. Possibly more than anything else, this is the real value of what computerization can contribute to an organization.

What form can this changing of attitude best take?

One practicality is that only those for whom training will be of least value can be spared from their work long enough; another is that the sources of funding are not necessarily in any way linked with the most appropriate training.

In general, we can divide training into in-country and overseas. Each can, in turn, be divided into short courses and long courses. Each can also cover: ISD as a topic in itself, one of the parts of ISD as a topic in itself, or a component on ISD within a more established tradition. Often this will be more a matter of "computers and ..." rather than ISD, but let us start from where we are.

There is also a pattern that greater training emphasis has been put onto "rural" than "urban" by aid agencies. Despite the title of this article, I would suggest that there probably ought to be no great divide.

The first major factor influencing the pattern of training in Britain is that the aid agency, the British Council, will not bring people to Britain for less than three months for training. There is also likely to be a follow-through of the World Bank pattern of training being increasingly project-oriented. Projects do not of themselves produce ISD design exercises other than at the micro-level. Designing the information system for a project is an aspect of training for which provision should be made, but project-oriented funding does not lead on to proper urban information systems.

The World Bank funded project in Jakarta for an Indonesian urban information system for the Ministry of Home Affairs looks like it might be moving in an interesting direction; it will have an extensive training component, so it should be worth following. The Economic Development Institute (EDI) proposals for building a training network will bear watching.

However, the ISD component, or more correctly the computer component of a project, is often written into the original project outline, from which training follows. Equally often, though, the computational component is introduced by planners without the training which the professional has been sent to gain. Ergo the project has inadequately allowed for the benefit of the training which will be gained in giving space for change. Where mainframe computing facilities are included this can be a major impediment. The practitioner, during the course will be introduced to new ideas of ISD during case work, but his response will be that he has to work within other parameters.

In Britain there are few long courses (long courses here usually mean at least one year, and short courses about three months) which are aimed specifically at third world participants. Instead there is often a complaint that the larger part of the course is unsuitable for the participants' particular environment. Courses in higher-level scientific disciplines particularly present this difficulty. The narrow focus of such a course ill prepares its participants for dealing with real-world ISD problems, a point I have alluded to earlier. Smithson and Land have commented at length on some of these issues.

This is not a problem limited to third world participants. There has been an increasing debate in Britain on the suitability of such training for middle and senior management from British industry. A course with which I am involved, although not aimed at third world participants, might give a clearer idea of what I mean.

It has been found in British industry that there is a shortage of skilled managers who understand both something about computing and management -- the business applications to which computing can be put. The M.Sc. course we run at Kingston Polytechnic takes people who already have something like ten years of experience, usually from a computing background, who are at a level where they should be taking on senior managerial appointments. They are released for seven weeks a year for two years to attend full time at the residential centre of the Polytechnic. During this time they receive lectures, take part in case studies, deliver seminars, and discuss topics, arranged under eight compulsory headings and eight optional, of which they take six. At the end of each year they are examined. In addition, in the intervening period, they must prepare information system design exercises which are also marked, and, throughout the two years, work on an industrial project, which is continuously assessed, and on which they are expected to work for a further fourteen weeks. The components of the course include information systems design, developments in data communications, management, expert systems, office automation, and so forth. Their projects all have to include both a theoretical component and to have reached the stage of practical application of prototyping -- in other words, understanding the social, political, and economic environment in which any information system design exercise is undertaken is as important as having a technical grasp of the issues.

In my opinion, this course is still too technically oriented for people who already come from a technical background and would presume too high a level of mathematical and computing skill for someone who was coming from a traditional professional background, but it does seem to be moving in what I consider to be the right direction. We have already been able to involve local government and planning officers on the course, who are producing interesting work. This is certainly the only course I know of in Britain which is taking this approach.

Let us now move on and consider how the training of third world participants is undertaken in three departments of the UCL. In the School of Librarianship and Information Science about a third of the M.A. course are from the third world. It is generally recognized within the school that the course is really in British information science and that it does not address the questions of circumstances of low literacy, very high rates of change, relatively low per capita income, or the absence of social security.

In the Department of Photogrammetry and Surveying there are a number of third world participants, some of whom are planners, working on survey methods and new technologies and their contributions to surveying. Yet, again, it is generally felt that they are being introduced to specialization at a very high level, to techniques which require a very high level of infrastructure support, in an environment where the social and political issues facing developing (or developed for that matter) countries are rarely raised.

In computer science there are again students, up to Ph.D. level, from the third world who are being given access to among the most advanced facilities which can be offered in Britain. One is, for example, a Kenyan statistician. Yet one must again ask, is this really either what he needs, or what statistics in Kenya needs? I could go on giving examples like this from the UCL, but would not wish the participants to be identified too easily. In most cases these people will be fairly senior government officials concerned at some level in "planning" though they will not all have come from either planning ministries or planning departments in local government.

In the Development Planning Unit (DPU), which is a department of the Bartlett School of Architecture and Planning, almost all students are from the third world. The DPU is specifically designed to address the planning problems of developing countries and to train their officials. Courses are run both at the master's and the short course level. I must say that we have not successfully introduced what I would consider to be a sufficient ingredient of the new technologies and their implications. Each course has a small component if only of the "computers and..." type. The possible exception is the Planning Ports for Development short course where containerization and roll-on-roll-off has made it more difficult to ignore technical change, even if these two technologies are not generally considered as main component of those affecting planning. The study of major European ports, though, does make an introduction to the more obvious technologies inevitable, as they have been much more deeply affected than, for example, in local government planning authorities.

There is, on the other hand, no course devoted to Planning Telecommunications for Development, or an informatics component in any of the other courses.

A survey of students over the past three years indicates that almost all recognize that computers are going to have an increasingly important part to play in their jobs and, increasingly, students have already had some contact with them. This is usually at the level of large mainframe installations, and often initially through payroll applications; indeed, it has been from the experience of trying to work on this batch processing with unsuitable software that much of the difficulty has arisen.

The difficulty of introducing an adequate level of computing into already established courses where only some of the participants had an immediate need, and the difficulty of introducing something at a level to sustain interest and enable people to grasp relevance when their own experience was so widely different, decided us that we should offer a special one-month option during the summer, specifically on computers for development planning. I am not suggesting that this is how it should be done. To concentrate on computers is not to train in information systems design. One could offer a course in ISD which had no computing component at all (though it would be increasingly incredible). One could offer a course in computing which had no ISD, which concentrated purely on the technical and computer centre management. But to train planners in ISD now, I think one has to start from the technical change which is reopening the subject.

The one-month course is I think sufficient to introduce the average planner to the range of computers available, to understand the terminology and the possible applications, and to give him the hands-on experience of a microcomputer that he can undertake elementary word processing, data base management, and spreadsheet design.

Needless to say, the participants in the course, which has now run for three years, were self-selecting in that they wanted to participate, and randomly selected in the sense that they were already in London and could be financed. People who regard using a keyboard as beyond their status would have selected themselves out. (Indeed one of the factors that influenced the ability of participants to master the course was the confidence which came from being able to type. Those students who could already type were at a distinct advantage, even though the speed with which you can hit a key is not of particular importance.)

The course has three parts, of equal importance. There is an introduction to the basic technicalities of computers, how they work, and what can be done with them, within the framework of systems design. Much of what I covered in the first two parts of the article is what is covered in the four weeks of the course.

In parallel, and starting on the first day, is hands-on practice with a microcomputer, one per participant. I tried group working, on the egalitarian idea that the strong would help the weak, but found it did not work. There must be a machine per person. I also found that an assistant is essential, probably at the level of one per six course participants. Discs get corrupted, loaded in upside-down, the difference between software and operating system gets forgotten; an endless procession of small details, not just in the initial stages, requires individual attention. But assistants add to the cost of the course.

The third component is visits to a series of planning authorities in Britain which have developed their information systems to different levels and in different ways. Some of them will still have no computing facilities at all, some will have gone quite a long way. There is none, however, which I have come across so far where there has been the planning of information systems design and development throughout the authority, though there are signs that planning is beginning to emerge. I draw on articles in the BURISA newsletter to which I referred earlier, plus my personal contacts for places to visit. I also try to ensure that we do not revisit the same authority twice. Planners in planning departments have their own jobs to do and cannot spend much of their time offering free training.

During the introduction to the technology and the visits, there is a thread running through the course which is an attempt to understand government policy and its contribution to development in Britain; and at the same time, to raise the question of the relative responsibility of local and central government for the development of information systems design and implementation in a developing (or for that matter any) country.

I do not think there is any point in attempting to teach programming in any established computer language. It is not only that I do not think this can be done unless continual application will follow, just as one cannot learn a spoken language without continually practicing it; it is rather more that I do not think this is the sort of skill which a planner needs to have. As I indicated in an earlier part of the article I think that commercially available packages are by far the most suitable. (I understand that the Planning and Development Collaborative International's (PADCO) package, for example, is based on Lotus 1-2-3.) This seems to me to be much more sensible than following UNCHS (Habitat) with its Urban DBMS and developing something from scratch in Basic.

In one month, a planner with no computing experience can gain a sufficient understanding of the technical changes which are taking place and their implications for his/her work that he/she can understand the literature and discuss the options open in a particular situation.

What we have also tried is for someone then to work for another couple of months, under guidance, trying to design his own specification for a particular application. This path which allows for a much more detailed study is worth following.

This is still not yet, however, to teach information systems design as a discipline for policy and planning -- we are only giving the bare bones of an understanding of what is going on and the ability to grasp the implications. The next stage in our development is a three-month course in Information Systems Design for Planners from developing countries. We are now planning an interdepartmental M.Sc. in information technology for development. These courses would have as equal components: Information systems design; development planning; and specific applications geared to the area of planning in which the participants are working.

These courses would be interdisciplinary, involving staff members from a wide variety of departments within the UCL, for it is now far beyond the expertise of any one person to hold the detail required. The participants would include senior practitioners both from Britain and developing countries so that the major benefit of the comparative method could be realized.

This approach to teaching information systems design is still novel in Britain. Just as the divisions I have remarked upon influence the teaching at UCL, most other institutions in Britain suffer the same impediments. Where special courses exist for third world participants (the Universities of Bradford, Manchester, Birmingham, Swansea, East Anglia, for example), there is as yet little attention paid to computerization, and no courses in information systems. At Manchester, in the Department of Administrative Studies the courses give an introduction to computing; at Birmingham, in the Development Administration Group there is as yet no formal training at all. It is probably also worth noting for the purpose of this article that most institutions in Britain concerned with developing countries have a predominantly rural focus.

The UWIST has announced an M.Sc. in information technology for planners, which they say will be suitable for participants from developing countries.

The Overseas Development Group at the University of East Anglia now also offers a short course in microcomputing for development planning, which is possibly similar to that offered at the DPU. I have not yet seen others advertised. It does seem clear, though, that this area is to grow. The Planning Adviser from the Ministry concerned with aid in Britain, the Overseas Development Administration, has asked me to convene a seminar to discuss the experience so far on introducing training for planners in the new technology. Again the emphasis should be noted: Still a long way from ISD, but I come back to this point fairly frequently; we have to accept that the reawakening of interest is a result of the changes in technology.

There is, of course, an alternative method of proceeding. This is, to take people who are predominantly from a computing background and give them training in developments in new technology. The United Kingdom Council for Computing Development (UKCCD) has followed this approach: Training managers in computing. The course run at the Central London Polytechnic has been their flagship. It must be borne in mind that the participants are not planners. In addition, I fear that there is insufficient attention paid to the applications which will be of concern to planners. We do not yet have sufficient experience to really be able to evaluate all the attempts that have been made. The UKCCD organized a conference of third world students working in Britain in the field of computing in April 1985, which was attended by more than one hundred students. This exercise is to be repeated. It was aimed predominantly at people studying computer science. When the Third World Planning Seminar was held in July 1985 it did not discuss the new technology although there were many third world planners present. We are still a long way from achieving any sort of synthesis.

Experience is now also indicating that students arriving in Britain are at a considerable disadvantage relative to British students. We are to run this year a trial course of one month aimed at M.Sc. level experienced students from the third world who are coming to Britain, where they will get an upgrading of their skills on current technological developments to better equip them with the level of work they can expect in the full M.Sc. course.

I could take the line of argument on the unsuitability of much current training practice into Europe. The Urban Database Management Symposium (UDMS) has now been held for ten years. Recently, the organizers have begun to pay attention to the particularity of the third world. Yet one has to say that, firstly, as a result of their own particular trajectory, they have a one-sided approach to urban planning information systems, and secondly, that the third world concern sits uneasily beside the main stream, rather than swimming in it. A more detailed survey of European practice is beyond the scope of this article, but would be worth making.

So far, we have been discussing training at the formal level of courses run usually at a university and usually outside the country, funded by aid which usually means tied to the aid-donor country.

Another valuable training mechanism is the formation of a professional body. From the traditions of the Royal Town Planning Institute, the Royal Institution of British Architects, and others, there have been set up local versions in some developing countries, which have survived with different levels of success, producing journals and newsletters, holding conferences, and participating in international bodies and meetings.

The work being done within the Ministry of Works and Housing of the Government of India indicates that the experience of the Urban and Regional Information Systems Associations, of which one exists in North America, Britain, and Australia could well be built on.

Those professionals from a computing background also have the experience of computing societies on which to draw. The British Computing Society has recently signed an agreement of association with that of Singapore. The Malaysian Society publishes a journal in which appears matters of interest to information planners. The formation of the Philippine society has been recently announced.

These bodies, in turn, have international links, such as the International Federation for Information Processing, which has a working party concerned particularly with developing countries.

At the level of these professional and international bodies, though, we are left with a problem. Training will be a matter of interest and concern to them, even if only one among many. Secondly, information systems and their design will be of anything from central to marginal importance. Thirdly, urban and regional policy and planning questions will again be at best only one among a number of issues. Fourthly, the particular concern for development planning and the third world is likely in almost most cases to be a minority interest. So in each body we are talking about a four-way division of interest. It is unlikely that there will be many people in any part of the world with a sufficient interest population to sustain a body capable of generating a discipline, just as it is unlikely that a faculty with even three out of these four interests could be maintained.

In Britain we have found that if one starts with the issue of the third world, there are a number of institutions concerned with training, policy, and planning. Within that field there are some interested in information, systems, and design. If, on the other hand, one looks at the technical institutions there are always a few people who have a third world interest or consultants with a third world experience who want to remain in touch. We have set up a body called Development Information which produces a newsletter, has periodic meetings, and consists of self-selecting members, most of whom come from Institutes of Development Studies. Then there is the British Computing Society Developing Countries Group, the Development Studies Association, BURISA, the Library Association International Group, the Institute of Information Scientists, and the Association for Information Management (ASLIB), the British Council, the Third World Planning Seminar, the Remote Sensing Society, and the British Library Research and Development Department. Development Information then becomes the point of contact for the four-way interest I outlined earlier. We also get the benefit of building on the work of others, for the four-way division this article addresses is likely to be the poor relation of each of the four directions from which this meeting point has been focused.

The value of conferences and seminars for reinforcing training and providing a mechanism for keeping up-to-date needs mentioning. It would be useful if announcements were effectively networked -- generally any out-of-country visits could be the result of manpower planning -- to make use of limited budgets.

POLICYMAKERS

This is rather a difficult term. There is a considerable literature dealing with information systems for decision makers, decision support systems, and similar phrases; yet, there is no agreement on who these people are or what they actually do, and attempts to investigate their information requirements have been disastrous. There is a confusion whether included here are senior officials and/or elected/political figures.

It is also difficult to talk of "training" at this level.

Further, there is an important argument on the strategy of actual information systems design which needs to be dealt with. At which level of the bureaucracy does one attempt to implement one's system? Crudely put: If one goes for a general coordinated policy across an extremely large institutional framework, one never gets a sufficient agreement; if one goes for getting started one has different and uncoordinated systems. This applies not only to types of computing equipment but levels of aggregation, data definition, periodicity, and so forth.

Every time one gets beyond the generality of ISD into a particular situation, often in a consultancy or tutoring a student, while one is trying to define the problem with which one is dealing, one is presented with a series of questions on the boundaries of the problem and the difficulty of defining the point of departure and points beyond which one does not want to go. To give an example: A group of students from a number of state-level governments in India were discussing regional housing information systems. The question they raised was whether they should each go it alone in their own authorities, coordinate at state level, or whether the Ministry of Works and Housing should properly coordinate a plan for India. This question needless-to-say was not simply a "technical" one; here lay questions about the relative power of the state and federal governments.

The level of training which deals entirely with policy and not with execution harbours a further difficulty. If policymakers attempt to avoid understanding the technical (just as the argument goes, using a keyboard is demeaning), trying to implement a system is dogged with difficulty as the people who have to make the technical decisions find that possible mistakes are not comprehended. Results are anticipated which are unachievable with the level of investment. This again is not a problem with anything specific to developing countries or planning. The National Computer Centre in Britain and the Open University have both produced excellent training material introducing the difficulties experienced if board members and executives fail to establish a clear agreement.

The body with possibly the most experience at this level is the Intergovernmental Bureau for Informatics (IBI) which has for many years run seminars for policymaking. Indeed, its entire approach to how best to introduce informatics planning in developing countries is to influence those whom it considers to be influential.

At this level, staff will not be available to go on courses. They will almost certainly, however, have been on courses earlier in their lives (certainly the professional rather than directly political appointments) and are likely to have a network of colleagues from those institutions -- an alumni association of sorts -- which will keep them in touch with developments. These associations can form a very effective medium for training. The Asian Institute of Technology is an example.

Training at this level has to consist almost entirely of awareness both of technical change and of implications. The IBI has found that seminars lasting a few days which are concerned with orientation are the most useful though these are extremely expensive to run. A degree of coordination among aid and training agencies could allow for a more coherent approach. One does hear the point made that every aid agency has a different proposition. The general lack of coordination among aid agencies, although it has a rational logic in terms of the interests of the donor countries, is undoubtedly an impediment to effective training.

The senior political appointees are the people, though, on whom, in many developing countries, one is dependent for a successful implementation. Influencing them cannot be underestimated.

CONCLUSION

(1) At each level of training we have to deal with a change in attitude which information systems design requires: That of seeing things systematically, the relationships which exist among parts of the operation, and how changes in one area affect another. In addition, the new technology creates an environment of uncertainty and change which makes possible changing bureaucratic structures, which otherwise appeared immutable. Further, data can be used in different ways, changing the organization of information systems.

(2) The rate of change of technology, its fall in price, and increasing reliability and compatibility, all mean that specialists who can keep up with the change and plan integration of ISD are an important component of any administration.

(3) The agency responsible for ISD within an organization needs to be selected with care, as it will be open to considerable political pressure, because planning and administration can draw on the same data, and because data needs to be integrated across agencies.

(4) The unevenness of "developing" countries has led to a certain mistaken opinion that modern technology is unsuitable, or that there is no scope for ISD. Though ISD may be undertaken with no new technology at all, there is still a need for training in ISD. The discipline is not dependent on the technology.

(5) Clerical and technical training must follow the initial planning phase of an ISD. It should be aimed not simply at administering the procedures, but understanding the principles, and the training component should be an integral part of the ISD.

(6) The training of new young professionals is the area where innovative work is most needed and will be most easily received. However, these professionals will not have the chance to actually undertake full-scale designs until later in their careers. To introduce them to new ideas which they will have difficulty implementing in their departments will lead to disaffection.

(7) Training material for this level has to deal with developments in technology as I have outlined in the technical chapter, with the data elements and flows of an urban planning ISD, but also with design methodology. Training materials need to be produced in these three fields and tested as a matter of urgency.

(8) Training for senior planners needs to be based very strongly on case studies. Training material at a variety of levels using a variety of sophisticated techniques needs to be developed. Within any course aimed at this layer, the political understanding of the management of change is as important as the technical: What I have called the information system environment.

(9) Policymakers will prove more difficult to introduce to formal training methods. They require more imagination in handling and inculcation into a culture. International seminars are likely to be important in this field.

(10) The literature in this field is still sparse. In each region institutions should undertake the development of documentation centres within centres of excellence. The beginning of these collections does not cost a great deal, for example, to make urban planning data bases or sources of software more easily available. Within these centres would be built up collections of software packages and sample data bases. The centres, in turn, would need to produce newsletters after the manner of Development Information. An outline feasibility and costing for such a centre should be undertaken.

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COMMENT

Frank le Clercq

The value of the paper is that it is very informative about the types of information and experiences with training already gained in the United Kingdom.

However, the introduction, the titles of several sections, and the conclusions promised more. The paper was inadequate in explaining an information plan, information planning, an information map, and the situation in developing countries.

These are probably contained in the paper, but are hard to find because of the way examples, experiences, and recommendations are presented. The central arguments of the paper could have been improved by a clearer summary in each chapter with respect to the main opinions raised, and their inclusion in a final chapter together with some overall recommendations.

The first part of the paper, up to the section on training of clerical and technical workers, deals with the various types of data and developments in information technology resulting from training, but sometimes opinions about experiences in the United Kingdom and the need for information as such, are mentioned. In the second part, the valuable arguments about information are weakened by the conclusions about training, which should be postponed; but the part about training and experiences with training programmes is clear. However, I wondered whether all the university programmes in the United Kingdom need to be reviewed so extensively. Their relevance to developing countries is not assessed as clearly as desirable.

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CONCLUSIONS AND RECOMMENDATIONS OF THE UNCRD EXPERT GROUP MEETING ON TRAINING IN INFORMATION SYSTEMS FOR LOCAL AND REGIONAL PLANNING IN DEVELOPING COUNTRIES, NAGOYA, 16-19 JUNE 1986

Introduction

Technological innovations in computer hardware and software and communications will have a catalytic effect on development planning and decision taking. Planning agencies and institutions are eager to adopt the new technologies, but a key constraint is human resources. There is emerging a substantial need for training and other human resource development activities to exploit this opportunity. International institutions have an opportunity -- and a responsibility -- to stimulate the development of effective training programmes.

Information is generated, organized, and distributed at all levels of management in an uncoordinated manner and at considerable cost. Local and regional planning, and plan implementation, require information from many agencies including national and international, and generate information which can be of use to many other agencies. This failure in coordination leads to a significant waste of scarce resources.

Appropriate Technology

There is a range of alternative approaches to using information systems in planning and development. In some situations, the most appropriate approach may be to develop large integrated data bases and computerized models. In other situations, the most appropriate approach may be to use rapidly developed simple methods and approximate data assembled quickly from a variety of sources. Careful consideration should be given to choosing the most appropriate approach in each specific situation. It is especially important that a range of such approaches be utilized in training programmes and in practice.

Need for Lead Institution

There is a need for a lead institution internationally to promote the rapid and widespread development of information systems for development planning and implementation. This should include activities such as: Providing a centre for documentation, including software, training materials, case studies, and evaluations; taking a major role in information dissemination; and taking a major role in coordinating training networks and user networks. Appropriate supporting roles for supranational regional institutions should be identified. UNCRD should consider what role it should play in this respect.

Role of Training

The need for training in information systems in the developing countries being now well-established, the right course for the countries in the region is to organize massive training programmes in their countries. The setting up of specialized training centres solely for imparting training in information technology is not necessary, as this would be costly, duplicative, and time-consuming to establish. The approach could be to establish such training programmes in existing centres which are imparting training in related fields such as national and area planning and sectoral management, public administration, and social development. The training centres should be formed into a network so as to facilitate exchange among them of information on applications and dissemination of training material. International agencies have a great role to play in establishing such a network and bringing about effective interaction among them.

Role of International Institutions

Local and national institutions need assistance in developing training programmes. International institutions should provide assistance in a number of forms: They should provide experts to participate in curriculum design or in teaching; they should provide assistance in identifying and documenting case studies, in finding resources, and in establishing linkages with national governments, international networks, and industry.

Training Network

A number of organizations are beginning to offer training programmes in information systems in development planning and implementation. A network of organizations involved in training should be established to enable these organizations to share resources, training materials, and experiences in order to develop effective practices rapidly. Such a network should be supported by a newsletter, annual seminars, and other techniques. High priority should be given to an early convening of training organizations and selected users to share experiences to date.

Users'/Implementors' Networks

There will be a rapid evolution in the use of information technology for development planning and implementation. It is essential that individuals and organizations developing and/or using information systems, have adequate opportunity to learn from one another's successes and failures. A user network should be established, including activities such as: Newsletters, software libraries, document libraries, meetings, and professional associations at local and national levels. Professional associations such as the Urban and Regional Information Systems Association (URISA), the Australian Urban and Regional Information Systems Association (AURISA), and related organizations have been particularly effective.

Training Issues

Training for information systems for development should include coverage of these major training areas:

1. Management - skills and techniques
2. Organization change - role of change agent, entrepreneurial and innovation skills
3. Development - social and economic development, planning and management of development, planning institutions and processes, and multilevel aspects of planning
4. Planning and project methods, models, and implementation, monitoring and evaluation techniques
5. Information systems
    - (a) Understanding the organizational environment
    - (b) Establishing goals
    - (c) The economics of information
    - (d) Information systems tools and capabilities
    - (e) Service delivery mechanisms
    - (f) Effective provision of information systems capabilities
6. Personal skills and attitudes
7. Training, including the training of trainers

Industry Involvement

Mechanisms should be established to involve the national and international information (computers and communication) industry in this effort. For example, a foundation could be established to collect financial contributions from information companies. Under the guidance of an independent advisory panel, these funds could be made available to support travel and/or training fellowships, for professionals in information systems for development.

Involvement of Professionals in Developed Countries

Mechanisms could be established to draw on the professional talents of information systems professionals in developed countries. For example, the various national and international professional organizations (e.g., International Federation of Information Processing (IFIP), Data for Development International Association, and many others) could invite members to volunteer to spend 2-8 weeks teaching or providing advice in a developing country organization. This would, however, require extremely careful sensitizing, coordination, and cooperation.

Promoting Innovations

Mechanisms should be established to recognize and reward particularly effective innovations in information systems applications in development. Recognition might include certificates of commendation, fellowships to training courses or to professional society meetings, publication in an appropriate journal or newsletter, etc.

Laboratories

Institutions (both training and implementing) should be encouraged to set up laboratories including equipment and software, to allow for experimentation in data capture, organization, processing, communication, and output.

Publishing

The publishing of software, catalogs, user newsletters, "bulletin boards," data bases, and documentation in a variety of media is now feasible. Alternative communications media include one-way or two-way via post, telephone, television, or radio (direct or via satellite). These alternatives should be assessed in order to evaluate possible international actions.

Research

Research is needed to develop and experiment with new approaches to the use of information systems in planning and development and especially in comparative analysis and evaluation of alternative experiences and techniques. Simple adaptation of present methods and techniques may not be the most effective approach in many applications. An expert group should be convened at an early date to develop alternative research strategies.

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The RDD is an updated version of the former Asian Development Dialogue published by the United Nations Centre for Regional Development (UNCRD). It is intended to be problem-oriented and interdisciplinary. Its basic objective is to bridge the gap between concept and reality, and policy and practice, in regional development.

UNCRD regards regional development as a major and integral aspect of national development. The RDD is one of the media through which UNCRD shares its experiences and research findings and generates a dialogue with a wide-ranging audience on various theoretical and applied aspects of regional development. By encouraging debate on critical questions in the field of regional development the RDD hopes to contribute to greater understanding of these issues, and thus ultimately to improvements in regional development policy and planning.

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